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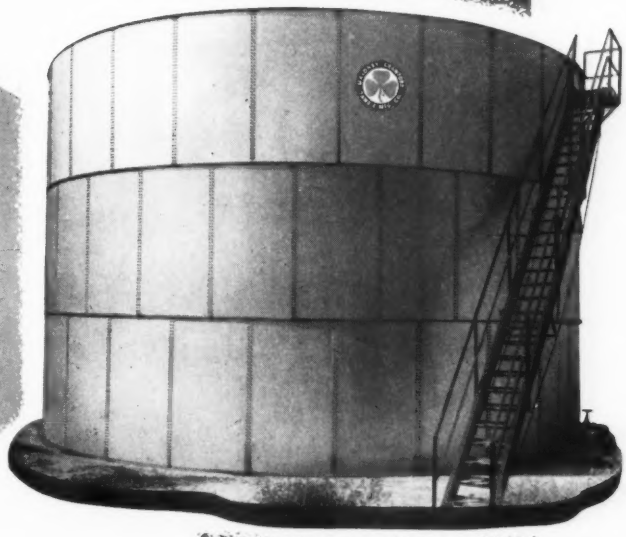

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the OIL AND GAS JOURNAL

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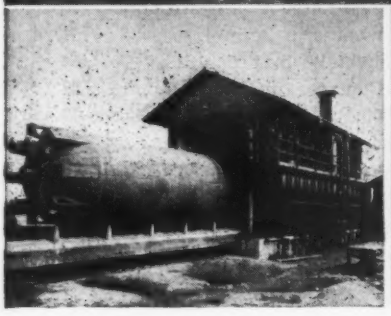

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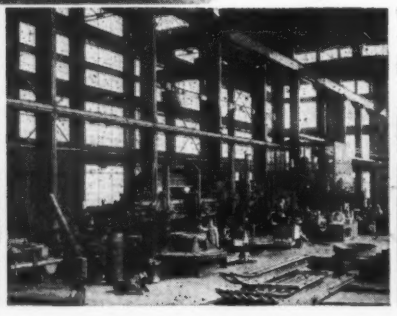

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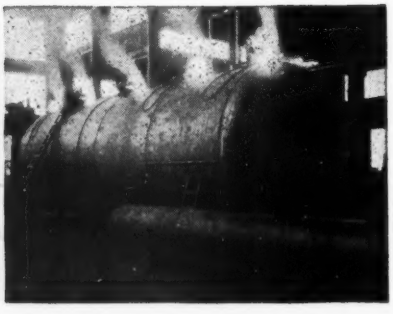

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THE OIL AND GAS JOURNAL

Telling the Customer

WE were motoring through Middle Western states 10 days ago while retail gasoline quotations were being adjusted upward to take care of increased bulk and service-station operating costs—the first increase for that purpose in many years. At three stations the other customers questioned the justification of higher prices. A truck operator's comments revealed that he had no appreciation of retail gasoline price trends in relation to those of other commodities and that he was convinced he was being "gypped" by profiteers.

This experience, which has been duplicated by that of others since the recent general advances in crude-oil and product prices, raises the question of whether the distribution end of the oil business does not have an obligation to inform customers as to the why of recent price changes and the fact that they were the first general revisions since prewar days. Many will assume that the tens of millions of petroleum consumers know the details of and appreciate the exceptional position they have enjoyed in regard to price, supply, and quality of products. An inquiry directed to representative users will be disillusioning in this regard. Many classify petroleum products with those commodities which have advanced 50 or more per cent over the past 5 years.

In newspaper and radio advertising or through statements made available at the service stations, the chronology of gasoline prices could be charted and the recent changes explained. Other products could be treated in the same manner. A comparison involving major commodities would be enlightening in showing the fortunate price position of petroleum consumers. In regard to wider margins for retailers and wholesalers no one will challenge the fact that merchandising costs are higher.

As to what could be presented to consumers, the latest report of the Bureau of Labor Statistics reveals that the index numbers of all commodities in June was 112.9, an increase of 50 per cent since August 1939, while the petroleum and products index was 64, a gain of 20 per cent. Price increases since June have not materially changed these relationships between petroleum and other commodities. Incidentally, the June 80.2 index for natural gas, field activities of which are closely related to those of petroleum, is actually six points less than it was at the start of World War II.

These data based on government reports could be presented along with equally factual information as to improved quality, prewar service, and adequate supplies which have meant absence of widening black markets.

In these confused times there is every reason to believe the consumer wishes to be fair in his appraisal of what the oil business has done and is doing. But he is entitled to and must have the facts in understandable terms.

Decision on Elk Hills Postponed; Forrestal Seeking Advice

by Henry D. Ralph

WASHINGTON.—The House Naval Affairs committee postponed until November 18 further hearings on the request of Standard Oil Co. of California for an amendment to its unit plan contract for operation of Elk Hills Naval Petroleum Reserve, after a stormy one-day session September 9.

The amendment, which would require the Navy to pay two-thirds of the cost of maintaining the reserve in a state of readiness, was approved by the Petroleum Reserves Office but higher Navy officials were noncommittal, and several members of the committee demanded that Standard give some consideration in exchange for being relieved of the entire cost. When it developed that the attorney-general, the judge advocate-general of the Navy, and the undersecretary of the Navy had withheld judgment on the proposal, the committee called Sec. James V. Forrestal, who announced he would consult independent oil men for advice, naming E. DeGolyer and A. Jacobsen as probable consultants, and will give the committee an opinion at its next hearing.

Comments on the Elk Hills contract situation and the Navy's petroleum-reserve program are published as a part of Watching Washington, page 68, this issue.

Clarification Sought

As explained by F. S. Bryant, vice president of the company, Standard is seeking only a clarification of a technical requirement of the 1944 unit plan contract to remedy an inequitable situation brought about by circumstances not anticipated when the contract was made. This requires Standard to absorb the cost of maintaining the entire reserve in readiness condition, and at that time it was believed that the company would continue to produce 15,000 bbl. of crude per day until it had taken 25,000,000 bbl. out of its 36 per cent of the pool. Proceeds from sale of this 15,000 bbl. was expected to compensate the company for these costs.

On May 10, 1946, however, the Navy ordered production reduced to 8,400 bbl. per day, this being the minimum amount the engineering committee determined should be produced in order to keep the field in proper standby condition. Standard was willing to have this counted against its share of the oil but protested that its sale would not cover production cost plus the entire readiness cost, estimated at about $600,000 per year.

The modification asked in the contract is that the Navy pay in cash its share—64 per cent—of the readiness cost, while Standard will pay its 36 per cent plus production costs out of the 8,400 bbl. per day permitted production. Standard also suggested that the 25,000,000-bbl. limitation be removed, explaining that present estimates of the reserve are more than 100,000,000 bbl. so that Standard is entitled to some 36,000,000 bbl. of crude. Within a few years this 25,000,000-bbl. limit will have been reached, after which, unless the contract is modified, the Navy will have to start drawing on its oil in order to produce the required minimum 8,400 bbl. per day. Since the Navy's policy is to keep its oil in the ground indefinitely, Bryant argued that this amendment is in the Government's interest.

The amendment was supported by Commodore W. G. Greenman, director of Naval petroleum reserves, who said its chief effect will be to cause the Navy to pay currently rather than ultimately for a benefit which it is now receiving, namely, the maintenance for military reasons of the reserve in good oil-field condition and in a condition of readiness. He explained that the framers of the contract did not visualize that Standard's production would be so low as at present nor that the readiness program would involve such expensive gas injection, drainage studies, and other operations now known to be necessary. If the amendment is not approved, Greenman told the committee, Standard could exercise its right to stop taking its oil, and the 8,400 bbl. per day would then have to be produced by the Navy under a section of the contract whereby eight-ninths of the oil would be charged to Navy's share.

Gerald D. Morgan, general counsel of the committee submitted an extensive analysis of the amendment, concluding that it is equitable and in the interest of the Navy's conservation policy, but recommending that as consideration Standard agree not to exercise its right to refuse to accept the minimum production as part of its share.

Morgan also submitted a lengthy study of the entire history of all Naval petroleum reserves and a description of current Elk Hills contract.

Journal Wins Second Consecutive Editorial Award in Contest

CHICAGO.—For the second successive year The Oil and Gas Journal on Monday was given an Award of Merit for the best illustrative treatment of editorial material in the ninth annual competition conducted by Industrial Marketing, a magazine serving the trade-publication field. The award was made to C. O. Willson, editor of The Journal, at a dinner meeting of the Chicago Industrial Advertisers Association. The plaque awarded to The Journal states:

Editorial achievement 1946 Award of Merit to The Oil and Gas Journal for the best illustrative treatment published during the 12 months ending July 31, 1946, in the ninth annual competition conducted by Industrial Marketing.

A total of 176 publications had 443 entries in the contest. In the illustrative-treatment classification in which The Journal won the award there were 49 entries. The Journal entry consisted of three multicolored sections of the International Issue of December 29, Annual Issue of January 26, and the Annual Refining Issue of March 30. The sections were entitled International Section, Annual Facts, Figures Forecast Section and Catalytic Refining. The entire editorial staff of The Oil and Gas Journal cooperated in the preparation of the features which were widely commended by the petroleum industry at the time of publication.

The awards were presented by James R. Kearney, Jr., president of James R. Kearney Corp., St. Louis, and Hal Burnett, editor of Industrial Marketing. Judges in addition to Kearney were:

C. B. Dietrich, A. M. Wagner Electric Corp.; Hubert J. Echele, president, Warwick Typographers, Inc.; O. R. French, president, Oakleigh R. French & Associates; Howard A. Marple, Monsanto Chemical Co.; E. A. W. Schulenburg, vice president, Gardner Advertising Co.

CHARLES L. THOMAS BRUCE K. BROWN JOHN HAPPEL S. P. CAULEY

These men figured prominently in the twenty-fifth anniversary meeting of the Petroleum Division of the American Chemical Society. Thomas, research director of Great Lakes Carbon Co., directed arrangements for the celebration. Brown, general manager of research and development for Standard Oil Co. (Ind.) was speaker at the dinner meeting, while Happel and Cauley, of Socony-Vacuum Oil Co., Inc.'s technical service division, presented a paper

A.C.S. Oil Discussions Reflect Advances in Refining Technology and "Know How"

by Arch L. Foster

NEWER developments in catalyst activity, the results obtained in catalytic cracking, and the means for evaluating the activities of cracking catalysts were subjects of important deliberation in the Chicago meeting of the Petroleum Division of the American Chemical Society this week. Others were accurate and rapid methods for determination of the hydrocarbon components of motor and aviation fuels and the refining processes therefor. Also of great interest to American refiners were the papers presenting the results of various experimental studies on catalytic cracking and methods for improving that most important process field. One of the most interesting reports is a proposed mechanism for catalytic cracking involving the presence and participation of water.

After studying more than a hundred fluid catalytically cracked gasolines, aviation and motor, it was reported that the composition and yields of these products may be varied over wide limits by varying the conditions of cracking, the nature and efficiency of the catalyst used, and the nature and composition of the feed stocks cracked, according to C. E. Starr, J. A. Tilton, and W. G. Hockberger of Esso Laboratories. In aviation gasolines from paraffinic stocks, cracked with synthetic catalysts (silica - alumina) the lower-boiling fractions are more olefinic, the higher fractions more aromatic. The greater the naphtha boiling range the lower the olefin content, the greater the aromatic content; A.S.T.M. octane rating falls off with rising boiling points of cuts up to about 200° F.; above this point the fractions show rising octane numbers as the boiling point rises, due to increasing aromatic content.

Benzene is produced in very small amounts in these gasolines, 0.1 to 0.4 volume per cent; toluene is in much greater quantities, from 0.6 to 2.5 volume per cent or 6 times the benzene content. Some narrow fractions showed as high as 86 per cent toluene. C_8 aromatics, including the three xylenes and ethyl benzene, are found from 1.7 to 5.2 volume per cent of the feed. The highest concentrations of naphthenes are found in the 200°-250° F. fraction of gasolines from paraffinic stocks. Naphthenes are formed in greatest yield when cracking conditions are mild, the authors stated; when cracking at more severe conditions the naphthenes above 200° F. boiling point disappear and are replaced by aromatics.

Cracking Naphthenic Feeds

Employing only synthetic silica-alumina catalysts on naphthenic charge stocks, aviation gasoline was made that had octane numbers from 87 to 96 A.S.T.M. with 4.0 cc. TEL per gallon. Most of the samples were low in olefins, concentrated in the lower boiling fraction. One sample, from a more easily cracked high-boiling charge stock (heavy Coastal gas oil) showed a much higher olefin content than the others, and the olefin content increases with the boiling points and ranges, indicating the lower severity of the operating conditions. Aromatics formation is greater from these stocks than from corresponding paraffinic charges for the same catalyst and similar cracking conditions; benzene is also the lowest in proportion. Toluene is formed in greater amounts, 1.1 to 3.8 volume per cent of the feed, or about seven times the amount of benzene. Some narrow fractions show as much as 88 per cent toluene. Yields of xylenes are also greater than from paraffinic stocks under similar conditions, 2.6 to 6.9 per cent of feed, or about twice the toluene yield. Ortho-xylene is an intermediate for the manufacture of phthalic anhydride by oxidation and dehydration of the side chains, a reaction which is being carried out commercially on the Pacific Coast by Standard Oil Co. of California, presumably with this raw material. These aromatics appear in some narrow fractions up to 98 volume per cent.

The use of simple hydrogenation to reduce the unsaturation of catalytically or otherwise cracked naphthas has proved to increase the yield of stable fuel of higher lean-mixture antiknock performance without damaging rich-mixture performance, A. Voorhies, Jr., W. M. Smith, and C. E. Hemminger of Esso Laboratories reported. Hydrogenation has been applied especially successfully to low-pressure operation to augment the aviation fuel supply, treating high-sulfur naphthas with sulfur-resistant catalysts.

For making naphthas of lower unsaturation directly from cracking, naphthenic stocks are superior to paraffinic stocks, low-boiling charge is better than high-boiling stock, and synthetic catalysts are definitely better than natural catalysts, they stated. The greatest octane rating and stability rating improvement is obtained by hydrogenating the light fractions; the heavy part of naphthas may be bypassed around the hydrogenation step satisfactorily. When a cracked naphtha, showing 92.2 octane rating with 4 cc. of TEL is hydrogenated, treating the whole naphtha, the rating is lowered slightly for the clear product; however, the rating of the leaded fuel shows 95.8, a boost of 3.6 numbers. Bypassing 40 per cent of the heavy ends and hydrogenating the 60 per cent light stuff shows the same clear octane rating as the unhydrogenated material, and 94.8 with 4 cc. TEL. This operation of bypassing the heavy material raised the potential throughput capacity of the hydrogenation unit by 66 per cent, however.

Hydrogenating four different Fluid cracked gasolines, showing octane ratings, with 4 cc. of TEL, of 87.0, 86.7, and with 4.6 ccl. TEL 88.5, and 91.0, respectively, the saturated products showed 98.5, 94.7, 96.9, and 93.5, with the same amounts of TEL in each case. Rich-mixture ratings ran for the unhydrogenated fuels 171, 159, 163, and 155 with the above amounts of TEL. After hydrogenation they showed, respectively 169, 162, 181, and 169, indicating no damage to the rich-mixture performance of the two using 4 cc. of TEL, while the two using 4.6 cc. show important improvements in rich-mixture ratings. In still another instance the 94 bromine number of the unhydrogenated product was reduced to 1; the octane rating with 4.6 cc. of TEL was raised from 88.5 to 96.6 A.S.T.M. Aviation Method. Practically no loss of naphtha occurred in any of these operations, either in laboratory or in large-scale plant operations, the yields from hydrogenation being practically 100 per cent.

Catalytic Cracking Mechanism

In the cracking of paraffins, says R. C. Hansford, Socony-Vacuum Oil Co. Laboratories, catalytic cracking does not show enough difference from thermal cracking to permit a complete differentiation of the two mechanisms. Catalytic cracking rates for paraffinic hydrocarbons do not differ from those of thermal cracking by more than one order of magnitude, Hansford stated; the rate of catalytic cracking of normal butane is only twice that of thermal cracking of n-butane, as proved by unpublished work carried out in that laboratory.

At least three general types of reaction mechanisms are found in catalytic cracking; (1) direct catalytic hydrocarbon conversion; (2) homogeneous thermal cracking, and (3) catalytic "reforming" of the products of thermal cracking. Hansford's experiments were carried out in a 300 cc. Pyrex catalyst bulb and accessory equipment, with a commercial pelleted synthetic silica-alumina catalyst containing about 12 per cent alumina and 88 per cent silica. To determine the existence or absence of exchange of hydrogen atoms the experimenters used also 98 per cent deuterium oxide (heavy water).

Partial desiccation of the catalyst by dry air showed a decomposition activity of the catalyst of 28-29 per cent. By adsorbing water on this catalyst from a current of air saturated with water vapor, the activity of the catalyst was boosted to 36-40 per cent or practically one-third. With 0.13 per cent water absorbed on the catalyst the activity was 36.6 per cent; with 0.18 per cent water the activity was 37.4 per cent and with 0.29 per cent water, it was raised to 40.2 per cent. This value indicates the percentage of a butane stream decomposed at about 900° F.

These results indicate that some interaction occurs between the water and the adsorbed hydrocarbon undergoing catalysis. By adsorbing deuterium oxide instead of plain water on the catalyst and carrying out the cracking operation therewith, mass spectrometer analyses showed a large amount of deuterium (heavy hydrogen) exchanged with both the cracked products and the uncracked butane in the charge. A blank check run without catalyst but with deuterium oxide present, showed no heavy hydrogen exchange with the butane or its products, indicating that the water enters into the catalytic operation reaction but not with a purely thermal reaction.

As a result of these experiments, Hansford proposes the mechanism of catalytic cracking of hydrocarbons to include reactions with water. This idea is supported by the fact that all active solid catalysts contain one or more hydrousmetallic oxides. Hansford believes that the facts support the idea that water is involved in catalytic cracking of hydrocarbons as a proton acceptor, taking protons either from —OH groups or from hydrocarbons. The "Bronsted" concept has it that absorbed water on silica-alumina gel acts as a base or proton acceptor, with the hydroxyl group at the catalyst surface as an acid or proton donor. The deuterium exchange experiments showed that a fairly high temperature is required to activate the proton removal reaction.

Regeneration Catalysts

In studying the regeneration of solutions for treating (sweetening and/or desulfurizing) naphthas, three catalysts which promote this regeneration are known; tannic acid and tannins, phenolic acids, and polyhydroxy-benzene, John Happel and S. P. Cauley of Socony-Vacuum Oil Co.'s technical service division stated. These catalysts possess the common properties of solubility in the solution, insolubility in the naphthas, and of being relatively stable under extraction and regeneration. These catalysts are oxidized easily in alkaline solution, a reaction which is inhibited by the presence of mercaptans. To prevent oxidation of the catalyst, tannin or other, it is necessary to maintain a definite minimum of mercaptan in the solution. The amounts of mercaptans necessary to be present vary with the catalyst; with 0.25 per cent of pyrogallol it is necessary to have 0.35 per cent of mercaptan sulfur present as inhibitor, that is, that much mercaptan must remain unchanged in the treating solution. With 1½ per cent of pyrogallol 0.75 per cent of mercaptan sulfur must be present. Tannic acid in 0.50 per cent concentration needs only 0.20 per cent mercaptan sulfur, and the same for concentrations of tannic acid up to 1.5 per cent, with other catalysts intermediate between these two catalysts.

On the strength of these results the authors state that, "We feel that tannins are the best catalysts in general use." In addition to the regeneration catalyst effect the tannins show a decided solubilizing effect on mercaptans and disulfides in the treating solution, promoting the removal of both compounds.

The program of the petroleum chemistry division included a total of 20 papers.

Water-Flood Report Available

WASHINGTON.—History of water-flooding operations in eight North Texas counties is outlined in a new 117-page Bureau of Mines publication prepared by Peter Grandone, D. A. Jessup, and D. B. Taliaferro, petroleum engineers at the Bartlesville, Okla., Petroleum Experiment Station. The report is now ready for free distribution.

THIS 1946 S M T W T F S WEEK

THE GOVERNMENT— Canol comes back into the limelight with the Senate war investigating committee terming the project an example of the Army's refusal to take industry's advice and its use of secrecy to cover bungling. . . . Mead committee invites Admiral King to explain what secret reasons caused him to press for completion of the project in 1943. . . . President Truman says Canol is a "dead horse" in light of the investigation made when he was committee head. . . . ¶House Naval Affairs opens hearing on request of Standard of California to modify Elk Hills Petroleum Reserve contract. . . . Company says present situation requiring it to maintain reserve in readiness is inequitable. . . . ¶Senate small business committee reported considering an investigation into the Oil and Gas Division and the advisory National Petroleum Council to determine if smaller operators are adequately represented. . . .

PRODUCTION— Oklahoma Corporation Commission makes drastic slash in West Edmond allowable because of gas waste. . . . Production cut from 77,000 to 40,000 bbl. daily after testimony that 319,000,000 cu. ft. of the total 384,597,000 cu. ft. produced daily is being vented. . . . ¶Renwar Oil Corp. and Bond Oil Co. buy Richardson Petroleum Corp. in Corpus Christi for $6,000,000. . . . ¶U. S. production for week ended September 7 drops 51,757 bbl. daily. . . . Texas output down 27,000 bbl. daily. . . . Well completion total falls back slightly to 596 in the September 7 week. . . .

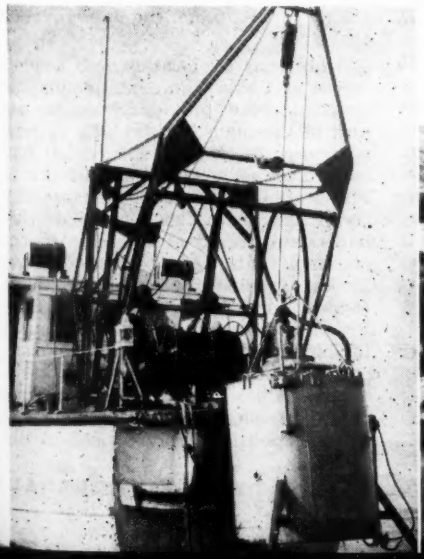
PRICES— RFC issues new regulations to implement the new policy reducing the stripper-well subsidy. . . . Instructions detail information required to collect payments. . . . ¶Deep Rock Oil increases margin in jobber sales contracts from 2 to 2 1/2 cents on housebrand in most of the Standard of Indiana territory. . . . Other companies reported making similar adjustments. . . .

NATURAL GAS— FPC issues approval certificate to Mississippi River Fuel Corp. for its $11,574,000 system expansion. . . . Program includes laying 265 miles of 22-in. loops, addition of 10,200 hp. to eight existing compressor stations. . . .

REFINING— Crude runs in week ended August 31 rise to 4,911,000 bbl. daily, 45,000 bbl. daily over preceding week and highest in slightly more than a year, A.P.I. statistics show. . . . ¶CPA amends tetraethyl order L-355 to prohibit further processing or blending to produce gasoline of more than the 78.5 top octane rating. . . . ¶Petroleum chemists gather in Chicago for the meeting of the American Chemical Society's Petroleum Division. . . . New developments in catalyst activity, methods of determining hydrocarbon components of motor and aviation fuels described. . . .

INTERNATIONAL— State Department moves cautiously with proposed United Nations world oil control body as a result of the storm of protest brought down by radio symposium and earlier address of John A. Loftus. . . . Scheme said to be viewed suspiciously by Latin-American governments who oppose any likelihood of interference in their affairs. . . . State Department oil advisers reportedly asked to make no comment which might stir up further opposition. . . . ¶Rene Ballivian, former financial counsellor in the Bolivian Embassy in Washington, takes over as head of YPFB succeeding Jorge Lavadenz. . . . ¶American Automobile Association advises tourists to cancel trips into Mexico in view of petroleum workers' strike. . . .

Standard Oil Co. (N. J.) is using the latest exploration techniques in waters off the Bahama Islands. Left: A 2-ton diving bell, containing gravimeter and observer, is lowered from ship into the water. Center: Emerging from the observation chamber of the bell is Dr. R. J. Watson, of Tulsa, manager of the exploration group of Standard Oil Co. (Bahamas), a Jersey subsidiary. With him are C. F. Sellers, left, in charge of the diving chamber and underwater gravity work, and J. Pollard of the exploring group. Right: Radar equipment atop the mast of the exploration ship "Stanba," to pick up targets as far distant as 18 miles, for accurate location of observation point



For a detailed discussion of the use of diving bells for similar work, see The Oil and Gas Journal, June 15, page 98. For an explanation of the workings of radar, see The Oil and Gas Journal, July 6, page 74

International

WORLD-WIDE OIL DEVELOPMENTS

Russians Plan Development For Eastern Turkmenistan

WASHINGTON. — Within the next few years, Russian oil production in eastern Turkmenistan, with particular emphasis on the Nebit-Dag fields there, is expected to climb rapidly and eventually become one of that country's most productive areas.

This statement is part of a rather lengthy article recently released by the Russian Embassy here. The statement, authorized by A. Mikhailov and M. Dmitriev, is part of a special supplement on "The Great Stalin Five-Year Plan."

This article also touches on the newly developed oil fields of Buzovna and Mashtaga, which went into production during the war. The fields are located in eastern Russia and reportedly stretch over "hundreds of miles with a limited number of oil strata."

Regarding the Nebit-Dag fields, the Russian writers stated that the fields are located in the midst of the arid desert wastes of Kara-Kum in Turkmenistan and that prospecting has confirmed the prediction that Nebit-Dag "would become a large and important oil field." Daily production there last year is said to have been 13,650 bbl. compared with 665 bbl. daily in 1933. The number of wells, in 1933, was eight, and in 1945 had been increased to 146, according to Mikhailov and Dmitriev.

Nebit-Dag's oil possibilities are said to have been known in the nineteenth century with the first well drilled there in 1882, but none of the first five wells resulted in the development of commercial oil and drilling ceased. Another try was made in 1927 and again was dropped, but in 1931 No. 12 came in as a gusher, and the next well which came in reportedly produced 2,100,000 bbl. in an 18-day period.

"It has been established that the whole of the Caspian Basin in the eastern district of Turkmenistan is composed of oil-bearing sands and covers an area of 9,650 sq. mi.," according to the Russian-written article which stated that "geologists have proved that some parts of this district have oil resources running into millions of tons."

Turkmenistan is located a few hundred miles northwest of Iran.

Russia's oil production under the latest 5-year plan aims at an annual production of 60,000,000 tons (420,000,000 bbl.), a figure reportedly 14 per cent over prewar production levels. Oil from the eastern regions presumably will provide 36 per cent of the country's total output in 1950, compared with the prewar production of 12 per cent. Baku's production during the present 5-year plan is expected to be increased 50 per cent.

Estimate of Production

While Russian production figures remain unavailable—in so far as any official source is concerned—the best estimates that can be obtained show that in 1945, Russia's total daily production was 550,000 bbl. Taking a 1938 estimate of Russia's annual production, 28,000,000 tons (196,000,000 bbl), a 14 per cent postwar increase would figure about 30,000,000 tons (210,000,000 bbl.), or only half of Stalin's projected annual oil output.

Production in the "second Baku"—located between the Volga and the Urals—continued to increase during the war, the Russian article stated, with geologists finding oil in the Devonian strata at a number of points in this immense area. And in the new 5-year plan, "exploitation of the second Baku will assume still wider dimensions. In 1950 the output of oil in the Volga districts will increase elevenfold compared with 1940, and in the Urals district by 320 per cent," the article explained, with new oil areas slated to be worked in the Tatar, Saratov, and Kuibyshev regions, as well as in the Urals.

Within a relatively short period of time, Mikhailov and Dmitriev stated, "four new oil fields will be established in the Kuibyshev region, and two cracking plants built. During the next 5 years, the output of oil in the Molotov region will be trebled." Indicating further changes contemplated under the 5-year plan, it said:

"A great deal of construction is to be organized in the oil fields, including oil pipe lines and other enterprises necessary for the oil industry. Until recently this construction was often carried on by state oil trusts, which to a certain extent diverted forces and funds from the extraction and refining of oil. Now a separate Ministry for the Building of Oil Enterprises has been formed. Operation of these new oil districts and oil fields will get under way more rapidly than hitherto."

N. E. I. Company Planning To Resume Exploration

SAN FRANCISCO.—Postwar operational plans in the Netherlands East Indies by N. V. Nederlandsche Pacific Maatschappij (jointly owned by The Texas Co. and Standard Oil Co. of California) calls for resumption as soon as political conditions there permit. The program was halted in the spring of 1942 when the Japs invaded that area.

Additional exploration and exploitation of fields where promising discoveries were previously made are part of the plans. This relatively new company in N.E.I. operations had carried on some exploitation work in Minas field. The Japs successfully completed a well where a derrick had been erected at the time of occupation. This well is situated about 25 km. (about 15½ miles) north of Pakanbaroe and west of the Siak River. Presumably the Japs planned to exploit at least one of the company's fields on a large-scale basis, but the Allies interrupted these plans before any shipments were made.

While political disturbances in the

East Indies continue to some degree, the company has reopened its Batavia office where an executive staff and a small force of technical men are stationed, awaiting when they can resume operations.

Pernis Refinery Back in Peacetime Operation

THE HAGUE.—Back in peacetime operation, the Pernis refinery of N. V. de Bataafsche Petroleum Mij. (Shell) is now reported able to handle a daily throughput of approximately 11,700 bbl., which compares with a prewar daily capacity of around 15,000 bbl., 12,500 cracked.

Recently, 200 tanks have been repaired, bringing the refinery's storage capacity to around 100,000 bbl. Before the war, storage tanks here were sufficient to handle about 150,000 bbl.

Anglo-Iranian Oil Hopes To Rebuild Prewar Fleet

GLASGOW, Scotland.—In announcing that Anglo-Iranian Oil Co., Ltd., has ordered construction of another tanker at a Clyde berth here, the company's chairman observed that Anglo-Iranian's prewar tanker fleet of 90 ships was the world's largest oil tanker fleet.

However, 44 of these were sunk and others seriously damaged during the war, but within the next year it is hoped to restore the fleet to its prewar status. Tankers are in great demand from British shipyards, it was said. The chartering of U. S. tankers involves spending dollars, the chairman explained.

Anglo-Iranian owns a 15,000-bbl. refinery at Grangemouth, Scotland, through a subsidiary, Scottish Oils, Ltd., and another 2,500-bbl. plant at Uphall, Scotland. Throughput figures represent daily capacity.

Czechoslovakia Allocates Fund for Oil Exploration

PRAGUE.—The sum of 20,000,000 krona (about $400,000) has been allocated by the Board of the Stalin Works to the Czechoslovakian Minister of Industry to form a Ministry of Industry Fund for Test-Drilling and Exploitation for Petroleum. By the end of 1946, this sum is expected to be increased to 60,000,000 krona.

Czechoslovakia's oil producing areas are believed to be confined to two oil fields—Hodonin in Moravia, and Gbely in Slovakia—and a small gas field at Vacenovice, Moravia. During the war, Czechoslovakia's oil production was around 200,000 bbl. a year. Some recent wildcatting has been done in eastern Ruthenia and north central Slovakia, with no reports indicating favorable production in these areas. This country's prewar reserves were estimated to be 8,000,000 bbl. Eleven refineries were on stream here prewar but this number has been cut to seven, according to current available information.

Japanese Troops Guarding Palembang Refineries

SINGAPORE.—Japanese troops are still guarding the two large refineries at Palembang, on the Dutch East Indies island of Sumatra, although it is now more than 12 months since the defeat of Japan.

Moreover, as late as midsummer the refineries were being run principally by Japanese technicians. Today, many are still there along with a labor force of about 7,000 Indonesians, 600 Chinese and 40 British Indians. The Allied military forces in Sumatra are reportedly regarded as insufficient to protect the oil fields and refineries without the use of some Japanese troops. The two Palembang refineries belong to Nederlandsche Koloniale Petroleum Mij. (Standard-Vacuum Oil Co.) and N. V. de Bataafsche Petroleum Mij. (Shell).

Russians Plan Exploitation Of New Central Volga Area

MOSCOW. — Exploitation of what the Moscow radio terms important oil deposits is slated to get under way some time during the month of September near Ulyanovsk, in the central Volga region.

Moscow radio said successful drilling operations have been reported in the past few weeks in Kamchatka, the Siberian Peninsula northeast of Japan, and on the island of Sakhalin, directly north of Japan and a short distance off Russia's eastern coast.

Prewar production from North Sakhalin was approximately 6,000 bbl. daily. Under agreements made at Yalta, it was recently announced that South Sakhalin, formerly under Japanese jurisdiction, had been granted to Russia, and it is believed that the Soviets are carrying out exploration work there.

Ballivian Named Head Of Bolivian Oil Agency

NEW YORK.—Rene Ballivian, former financial counsellor in the Bolivian Embassy in Washington and a delegate to the Bretton Woods monetary conference, has been named to succeed Jorge Lavadenz as president of Yacimientos Petroliferos Fiscales Bolivianos (Bolivian Government Oil Fields), according to information made public here early this week.

Ballivian was educated in the United States and lived here many years. Two other new members of YPFB's board of directors are Jorge Govalvenz and Rene Aszarrunz. Lavadenz went out as head of the government petroleum agency following the political unheaval in Bolivia early in August. Despite the change of government, the projected $17,000,000 program for pipe lines and other construction will be continued.

International

WORLD-WIDE OIL DEVELOPMENTS

Production of Hungarian Company Drops 19 Per Cent

WASHINGTON.—A drop of 19 per cent in the Hungarian crude-oil production of MAORT, a Standard Oil Co. (New Jersey) subsidiary, for 1945 was recorded in comparison with 1944's production. The 1945 output was 655,567 metric tons (5,019,129 bbl.). MAORT is the Hungarian company of Magyar Amerikai Olajipari Reszventarsaag.

The producing fields were under German control for the first 3 months of 1945 and operations were suspended during part of March and April. The Soviets controlled the field for the remainder of the year.

Crude-oil output in the Budafa field during 1945 totaled 201,215 metric tons (1,540,460 bbl.); at Lovaszi, 405,228 tons (3,122,498 bbl.); and at Hahot, 49,124 tons (356,171 bbl.). Natural-gas output at the three fields during 1945 totaled 12,833,906,589 cu. ft. These figures are from the U. S. Commerce Department's Foreign Commerce Weekly.

Italian Producer Reported

WASHINGTON.—According to information received by the Foreign Commerce Weekly of the Department of Commerce, a well producing gas and traces of oil has been drilled near the top of the Lodi structure in Italy by Azienda Generale Italiana Petroli. Two other wells were said to be drilling down-structure, but at the end of June had shown only traces of gas and oil. The Lodi structure is generally considered the most promising of all the structures of any consequence found in Italy.

Trinidad Oil Exports Up

WASHINGTON.—Although gasoline was off slightly, exports of all liquid petroleum products from Trinidad, British West Indies, in 1945 increased 4.5 per cent over 1944. Major exports as reported by the Foreign Commerce Weekly included gasoline, 5,022,349 bbl. (1944: 5,465,939 bbl.); gas oil, 795,686 bbl. (1944: 451,155 bbl.); and fuel oil, 13,369,446 bbl. (1944: 13,269,998 bbl.).

International

Well-equipped camp (left), leased by Richmond Exploration Co. from Creole Petroleum Corp., and the village of Pedernales (right). Both camp and village are located on a few kilometers of permanently dry ground which is the only habitable spot in the great Orinoco Delta area

Exploration of Orinoco Delta Fraught With Difficulties of Terrain and Climate

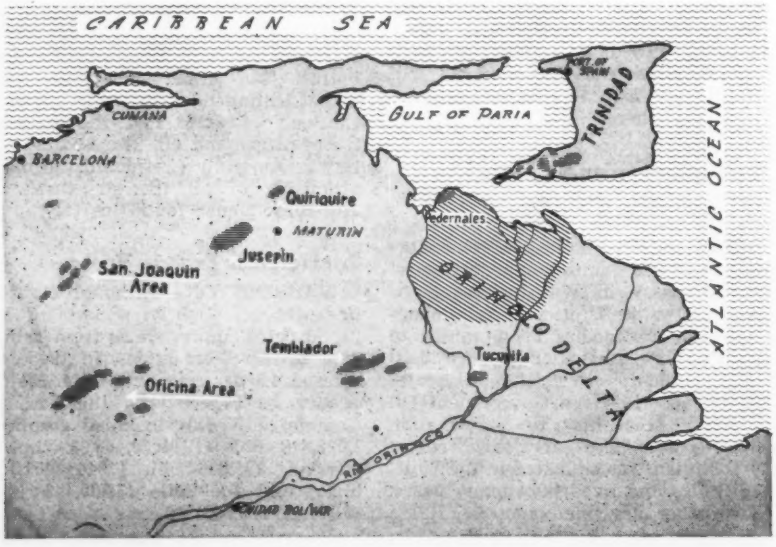
by Paul Reed

This article is the third in a series by the author, dealing with the largest exploration areas in Venezuela. Others were on Guarico, in the issue of March 15, and on Barinas, in the August 10 issue. Material was obtained on field trips to these areas this year.

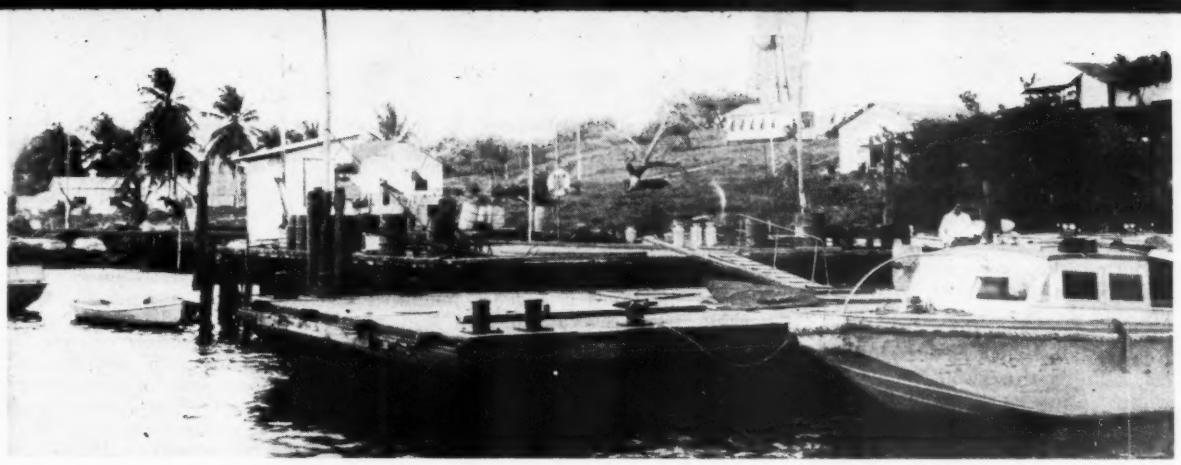
THE venture of Richmond Exploration Co. (Standard Oil Co. of California) for exploring the vast, dismal, mangrove swamps of the sinking Orinoco Delta is significant in the search for large oil reserves in Venezuela.

For years the great possibilities of this delta, comprising the Territory of Delta Amacuro, have been apparent to the industry for several reasons, including the great thickness of the sediments in a deep geosyncline, and evidence of petroleum from seeps, asphalt lakes, and a few oil wells at Pedernales. In addition, there is the delta's favorable structural position in relation to the principal producing area of the Island of Trinidad, only 9 miles northeast of Pedernales, at the tip of the delta.

But the difficulties of working in this delta area of tidal, insect-infested swamps have previously discouraged undertakings on the scale of Richmond's current operations. These must be supplied entirely by boat



Map showing location of the Orinoco delta with respect to Eastern Venezuelan fields. Shaded area indicates sphere of Richmond's current Delta exploration efforts



Dock at Pedernales camp with diesel boat belonging to a fleet including tugs, launches, barges and wind boats which transport all supplies and personnel for Richmond's delta operations. Seismograph equipment repair shop (left) and power plant (right) in the background

across the Gulf of Paria from Guiria to Pedernales in a section of the delta which is the most uninhabitable part of Venezuela. Even a brief view of the conditions encountered by Richmond indicates the courage required to overcome difficulties in searching for new delta reserves. Still the possibilities of the delta promise to hold the attention of the industry for years to come irrespective of immediate exploration results.

Within the next 2 years Richmond intends to carry on seismograph and wildcat drilling exploration on its 44 delta concessions comprising a total of 435,000 hectares (1,048,000 acres). In addition, during this period a land survey will be conducted of the entire concessions for the purpose of map making.

Plans are being made for moving in a rotary rig for a test to be located at a point yet to be determined. Earlier drilling experience prior to the company's program indicates that piling must be driven into the swamp mud to a depth of 120 ft. for derrick foundations. It is expected that quarters for the crew will be built on stilts to elevate them above high tide.

In western Venezuela Richmond has an extensive program for exploring 717,000 hectares (1,747,000 acres) where the company has a gravity-meter party and two seismograph parties in the field, as well as four rotary rigs drilling deep tests.

The program of Richmond is being conducted under the direction of Arthur B. Brown, resident manager, at Caracas. From April 1944 until January 1946, Venezuelan operations of Richmond were handled by Carl T. Newcomb, resident manager during the period when the field staff was organized and both land and seismograph surveys were getting under way. Newcomb had a background of experience with oil exploration in China, the Philippines, the East Indies, and South America when he approached the problems of the Orinoco Delta and western Venezuela.

Richmond field operations are based at a substantial well-equipped camp at Pedernales on the northern tip of Amacuro where a few kilometers of permanently dry ground represent the only habitable spot of land in this delta area. The camp was built by Creole Petroleum Corp. for its nearby oil-production operations conducted from 1933 to 1942 and is being leased from that company.

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Located as it is on a promontory overlooking an inlet of the sea, this place happens to be one of the most attractive oil-company camp sites in Venezuela. Field operations are conducted by the company staff in connection with a seismograph party of Petty Geophysical Co., and engineers of Bechtel-McCone Co., which has contracted the land surveying. Company and contractor's personnel work from Pedernales and from floating camps.

The entire operation in the delta is dependent on the company's fleet of boats, consisting of tugs, launches, barges, "wind boats" and marsh buggies. The basic unit is a diesel-engine boat of a type utilized for shipping supplies from the port of Guiria 65 km. (42 miles) north of Pedernales as well as for moving seismograph and surveying personnel along the caños of the concession. At Pedernales the company has several diesel boats of this type as well as several "wind" boats.

(Left) Engineers and superintendents going through swampy Orinoco jungle along a typical pica equipped with ground poles and side-rail. All equipment for the seismograph party is carried by national laborers over such picas provided for their work. (Right) Typical survey station at the end of a pica on the shore of a caño

During the early months of this year, when the writer visited the project, the procedure has been for the parties to go out each morning from the Pedernales base along the caños to the adjacent area being worked. Most of the movements of the parties are over paths, known as picas. Men walking over them are protected from sinking by means of poles laid along the pica route over the swampy ground. A fairly high rail along the pica can be grabbed to maintain one's balance. All equipment must be carried by national laborers along the picas. At night it is stacked on a temporary platform above the water level in charge of a watchman. As operations moved further away from the Pedernales base, it has been necessary to house the seismograph and surveying parties in houseboats.

Because of the manner in which the main streams and tributaries—all known as caños—intersect the delta, much of the Richmond concession is not more than a few kilometers from water transportation. All caños are deep, about 60 ft. or so. Some are as narrow as 40 ft. However, there are areas so remote from the nearest caño that it will be impracticable to operate from a barge base. For these it will probably be necessary to erect temporary camps built on stilts.

The large and difficult undertaking of surveying the concession was expedited by use of aerial photographs made in previous years by Creole Petroleum Corp.

Seismograph surveying is done by the reflection method, along a network of straight lines. Results have been satisfactory though almost continuous experimentation is required. This is the first reflection shooting done in this part of the delta. Fifteen years ago the area was shot by the refraction method.

Because of the difficulty in moving over swampy ground, only 4 to 6 spreads can be shot in a day in the Orinoco Delta in contrast with an average of 12 spreads a day which this same seismograph party has shot on favorable terrain. In the delta two or three shots are required to complete a spread.

Shooting is usually best done at a depth of 75 to 200 ft. The usual procedure of the party is to jet down a hole in 30 minutes to 2 hours, using a Homelite pump and rotating the drill stem by hand. Plastic joints of 10 ft. by 2½ in. casing and aluminum drill stems are used.

The subsiding Orinoco Delta region is characterized by the unusual depth of main streams and distributaries. In fact the Orinoco is the deepest river in the world. Alluvial deposits mixed with decayed swamp vegetation cover much of the area with a thickness of several hundred feet; these deposits are sinking faster by subsidence than they are being built up by sedimentation.

Along the caños is a dense jungle varying from several hundred feet to 3 or 4 miles. Behind this jungle are some isolated but extensive open, grassy marshes beyond which there can be seen more swampy jungle.

Scattered at great distances along the caños intersecting the swamps are isolated palm-thatched huts of the Guarauno Indians built on stilts above high tide. These Indians, living by fishing and gathering mangrove bark for tanning, are the only inhabitants of the delta.

Geology of Orinoco Delta

Pedernales is on the north side of the Delta Amacuro Basin, the south side being at the Brazilian shield south of the Orinoco River. The large Jusepin-Mulata-Santa Barbara field 75 miles away is on the north side of the basin; the east side of the basin is offshore in the Continental Shelf.

The delta itself is regarded as belonging to Present and Pleistocene but not earlier than Pleistocene time. Deeper than Pleistocene there are believed to be 8,000 ft. of Tertiary sandstone and limestone deposits which appear to be more marine than deltic in their origin. It is assumed that these lie on Cretaceous limestone deposited on basement rocks.[1]

The Amacuro Delta Basin is superimposed on the great eastward plunging Orinoco geosyncline extending westward along the north flank of the Brazilian shield, outlined roughly by the present course of the Orinoco River. According to Liddle,[1] the Orinoco geosyncline was the result of down-warping resulting from compression forces from the north thrusting against the rigid land mass to the south which also produced buckling or up-warping observed in the mountains of northern Venezuela.

Of much significance for oil exploration in the Orinoco Delta is the structural relationship with the Island of Trinidad, indicated by an uplift in a narrow zone with steep beds which is referred to as the southwest extension of the South Range anticline of Trinidad, and extending through the famous Soldado Rock[2] in the Gulf of Paria and also through Pedernales. The principal oil fields in Trinidad are located near this southern range. Until late Miocene, it is assumed that Trinidad was part of South America. Formations of both island and mainland have been correlated.

A certain tendency for oil to become somewhat sweeter to the eastward in the Trinidad-Amacuro Delta area is indicated by two trend lines, one intersecting the relatively high-sulfur crude-oil fields at Pitch Lake, Trinidad, and the old Pedernales field, Venezuela, on one hand; and the other intersecting the lower sulfur-content oil fields of Forest Reserve, Trinidad, and Tucupita in the Amacuro Delta, Venezuela. To date crude oil in the Orinoco Delta wells has come from sands. But since it has been generally observed over the world that sour crude is associated with limestone, there has been some speculation that large production of sulfur crude in the delta may originate in Eocene and Cretaceous limes.

From 1933 to 1942 a total of 9,036,014 bbl. was produced in the Pedernales field by flowing, according to published reports.[3] This field was developed and operated by the organization originally known as Standard Oil Co. of Venezuela which later became Creole Petroleum Corp. After Creole discontinued operation in 1942, a total of 19 wells had been drilled of which 11 wells were classified as shutin, 3 inactive, and 5 abandoned. Production came from between 5,000 and 6,000 ft. A deeper test had been drilled to 7,853 ft. Initial bottom-hole pressure was reported as 3,200 psi.; by the end of 1938 this had declined to 2,200 psi. Gravity of oil reported at the time of the 1942 shutdown has been given as 21.5° A.P.I.; at times wells have been drilled which made oil with gravity as low as approximately 15° A.P.I. Sulfur contents have been reported between 2.8 and 3.+ per cent. Initially the wells produced at the rate of 400 to 2,000 bbl. each. All of the wells are located in a fairly narrow area: Near the water's edge either slightly inland or close to the shore.

Small asphalt ponds fed by active seeps near Pedernales formerly were worked intermittently during the past 50 years by English and Germans.

Near the edges of the Amacuro Delta basin there are seeps with oil of higher gravity than any produced in the delta area so far.

The three great exploration regions in Venezuela which are outside the states now producing are those in the states of Barinas, Guarico, and Territory of Delta Amacuro. The disadvantages of swampy terrain in the Delta are offset by the ease of making ocean shipments to and from the area and also by certain encouraging prospects incident to its relation to existing fields. But at best operations on a large scale in the delta will be more difficult than present producing operations in eastern and western Venezuela.

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2. H. G. Kugler: "The Eocene of the Soldado Rock Near Trinidad," Boletin de Geologia y Minera, Ministerio de Fomento, Venezuela, Abril-Julio-Octubre 1938.
3. A.I.M.E. Petroleum Division, Transactions, 1934-1944.

Through the efforts of this group, the steering committee, plans for the short course on instrumentation became a reality. Shown are: Porter Hart, Dow Chemical Co.; P. G. Murdoch, Texas A. & M.; R. E. Hanson, Leeds & Northrup Co.; Jimmy Dvoracek, Climax Industries; M. K. Anderson, Carbide & Carbon Co.; L. W. Parten, The Foxboro Co.; W. H. Fortney, Humble Oil & Refining Co. Absent: G. L. Gudenrath, Hudson Engineering Corp.; L. A. Williams, Sinclair Rubber, Inc., and R. L. Mallory, Minneapolis-Honeywell Regulator Co.

Texas A. & M. Holds First Short Course on Instrumentation

by R. B. Tuttle

COLLEGE STATION, Tex. — The first of a series of annual short courses for instrument engineers ended here September 6 after a 3-day session in which many problems vital to the petroleum and other process industries were covered in talks and discussions. Subjects ranging from the economics of instrumentation to the theory of process control were covered by the 10 papers presented before the group of more than 200 engineers attending the course at Texas A. & M. College.

The question-and-answer period of Friday afternoon was the highlight of the course wherein all authors appearing on the program plus a consulting engineer composed a panel which answered questions and led discussions.

Presiding over the opening period Wednesday morning, J. D. Lindsay, head of the department of chemical engineering at Texas A. & M., introduced Gibb Gilchrist, president of the college, and P. G. Murdoch, professor of chemical engineering and chairman of the steering committee for the short course. President Gilchrist welcomed the group and advised of the interest the college is taking in this and in the other short courses held currently at A. & M.

Dr. Murdoch in his talk on the purpose and nature of the short course, said, "It is the purpose of this course to interrelate and unify, as far as possible, all the different aspects of instrumentation and control." Although the course is to be maintained at the engineering level, Dr. Murdoch said, "This does not mean that the problem of instrument maintenance, for example, will be neglected, but rather that it will not receive primary emphasis." This aim appeared to be borne out both in talks and in discussions and at no time were problems relating to maintenance put aside. In fact, even lubricants and packings for motor valve stems came in for a large part of one discussion period. In general the papers and subsequent discussions appeared to cover the engineering field vertically from research to maintenance.

The first paper on the program, "Some Economic Considerations of Instrumentation," was presented by Dr. C. S. Comstock, Monsanto Chemical Co. This paper could be considered as covering one of the subjects of prime interest. Dr. Comstock said, "It is hard to conceive of operating any process plant which does not require at least a few instruments to even enable operation at all."

"Measurement of Liquid Flow and Liquid Level," by L. K. Spink, The Foxboro Co., was presented second on the Wednesday morning session. This paper described the group of instruments coming within the scope of its title and pointed out some of the pitfalls commonly encountered in installation. Some very interesting slides showing instruments developed by the Germans for their war industries were shown by Mr. Spink.

Two papers were presented Wednesday afternoon, the first of which was on "Measurement of Temperature and Pressure," by Dr. V. L. Parsegian, C. J. Tagliabue division, Portable Products Corp. This paper covered a wide range of subject matter and received the general interest of the group. The other paper, "Survey of Electrochemical Measuring Devices," given by Dr. W. N. Greer, Leeds & Northrup Co., was on pH-measuring devices. Dr. Greer related some of the problems encountered with conductivity cells and talked on methods of temperature compensation for instruments employed in this specialized field.

Theory of Process Control

At the Thursday morning session J. G. Ziegler, Taylor Instrument Companies, made a talk on the general theory of process control. The talk was on the basis of a classroom lecture and without benefit of slides or other illustrative matter except the blackboard which he employed constantly to make clear a point or put over a thought.

E. D. Mattix, Cities Service Refining Corp., presented "Analysis of Control of Light Ends Fraction," a paper dealing with application. This paper described how a process was analyzed, what instruments were installed, and the results of their operation in producing a quality-concontrolled product.

A joint paper by J. B. McMahon and A. W. Landon, Republic Flow Meters Co., was first on the Thursday afternoon session. Dealing with the four operating variables, of temperature, pressure, flow, and liquid level, the talk was titled "Control of Primary Operating Variables."

"Pneumatic Circuits for Measurement and Control," by W. B. Heinz, Penn Industrial Instrument Corp., was the last paper presented at the Thursday session. Heinz demonstrated an apparatus, which may be aptly termed a transmitter, whereby pressures may be amplified to show a gain in the magnitude of tens of thousands.

The paper, "Control Valve Characteristics," by T. B. Burris, Fisher Governor Co., was the first to be presented at the Friday session. This paper appeared to be vertical in coverage on the subject and went into some interesting details on characterized valves. Slides given with this paper showed some of the many

(Continued on page 75)

WASHINGTON WATCHING

BY HENRY D. RALPH

The Lesson of Canol

WASHINGTON. — The only thing new in the Mead committee's revival of the ill-starred Canol project is the lesson it carries, namely, that the military is hopelessly out of its league in economic and industrial operations and that secrecy is too often a cloak for inefficiency and bungling.

Canol is, as President Truman said last week, a "dead horse," and very dead indeed. The Foreign Liquidation Commission is now trying to dispose of the $130,000,000 investment, and its official report indicates that most of the pipe lines and refinery equipment are not worth salvaging for scrap.

What brought Canol into the news again was the annual report of the Senate war investigating committee with a reference to Canol as an illustration of how the Army refused to ask or accept advice from industry, stubbornly refused to admit an error in the face of the severest criticism, and used the plea of secrecy to cover up the facts.

There was nothing in this report that had not been brought out during the original Truman committee investigation when the public record was filled with the unpleasant story of how the Army attempted to develop an oil industry in the Canadian arctic wilds, spending millions of dollars, vital man-hours, and tons of scarce materials on a project which all oil industry and impartial experts condemned as cock-eyed in concept and foredoomed to failure.

Oil Companies Against Project

Fortunately for the oil industry, the two companies which the Army dragooned to do the work—Standard of New Jersey and Standard of California—are entirely in the clear. Both early went on the record in strong terms against the Canol project and suggested better ways of supplying oil to military operations in Alaska. If the oil industry had wasted the nation's resources in such a way we not only might have lost the war but the ensuing scandal would have been many times greater than the opprobrium now attached to the War Department.

The crux of the present controversy is the Senate committee's reminder that after its investigation clearly indicated that Canol was a fiasco the War Department insisted that it must be completed at any cost, and produced a statement from the Joint Chiefs of Staff that completion of Canol was vital for reasons so secret that Senator Truman himself could not be permitted to know them in confidence. This report was signed by Adm. Ernest J. King for the Chiefs of Staff, who now complains that the committee is smearing him with the Canol stick. So the committee has invited the admiral to tell it what secret reasons caused him to endorse Canol back in 1943.

What the Foreign Liquidation Commission is currently trying to sell is what the Army describes as Canol 1, the 458-mile 4 and 6-in. crude pipe line from Norman Wells to Whitehorse and the 3,000-bbl. capacity Whitehorse refinery. Canols 2, 3, and 4, are small products pipe lines radiating from Whitehorse north and south along the Alcan highway and to the coast at Skagway, Alaska. Canol 1 was abandoned by the Army in the spring of 1945, before the war was over, but it has been using the products pipe lines to a limited extent until recently.

Unfavorable Economic Aspects

The crude pipe line cost more than $61,000,000, operated for about a year in 1944 and 1945, and delivered 975,000 bbl. to Whitehorse. The refinery cost more than $26,000,000, operated about 8 months, and produced 866,000 bbl. of products, of which 200,000 bbl. were consumed as refinery fuel. Operating costs for this period were $4,824,000.

"Competent military authorities of both the United States and Canada," says the FLC report, "consider the refinery and crude oil pipe line systems of questionable value even in the event of another emergency. Investigation has disclosed no known possibilities for postwar use as an entirety. There are unfavorable economic aspects, such as the expense of operation and maintenance and the limited capacity of the installations. Extremely limited market outlets for petroleum products within the areas to be served in peacetime, the evident lack of balance between output of specific products and the local demand for such products, will in all probability preclude sale of the property for operation in place."

Some of the pipe and other equipment might be salvaged for use elsewhere, but FLC warns that it will be difficult and expensive to get any of it out. The surplus property law prohibits bringing any of it back to the United States. The Canadian Government has first choice in buying Canol, but it has expressed no interest in exercising its option. It did buy the Alcan highway, an Army project of almost as doubtful military value as Canol, and paid the United States $1 for the whole works. FLC may be lucky to get that much for Canol.

A Muddled Reserve Theory

THE Elk Hills hearings before the House naval affairs committee this week serve as reminders of the cumbersome business methods necessitated by government organization as well as of the muddied thinking surrounding the entire concept of Naval petroleum reserves.

All that is involved in the current proceedings is two minor technical amendments in the operating contract between the Navy and Standard Oil Co. of California, with both parties in agreement on the changes. If two private corporations were concerned the changes could be made in a few minutes, but the Government doesn't do business that way. Because government oil dealings are supposed to be peculiarly susceptible to scandal and intrigue, and because Congress doesn't trust the Navy to handle its oil matters, no changes can be made in the operating contract without approval of the House and Senate naval affairs committees. This involves two formal hearings in Washington, with elaborate presentations by both the company and the Navy.

Changes Made Necessary

The two changes now under consideration are made necessary by the policy of the Navy—fully concurred in by Congress—of keeping all its oil permanently locked up in the ground so that some time in the future when everybody else runs out of oil the Navy will still have a little.

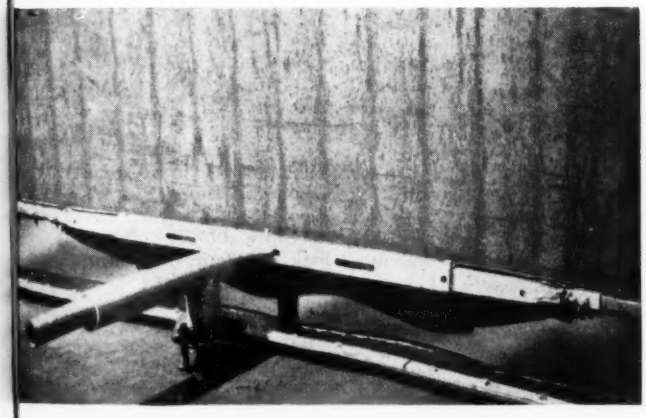
The Elk Hills field, the only Naval petroleum reserve of any consequence, was set aside in 1912. During the First World War it produced practically nothing, and if the Allies floated to victory on a sea of oil it wasn't on the Navy's oil. During World War 2 Elk Hills remained virtually shut in during the period of greatest oil shortage, and it was not until the last months of the war that production got up to 50,000 bbl. per day—one tenth of 1 per cent of the

(Continued on page 72)

Losses equal 1.82%

of input!

The principal *controllable* losses in refineries are *evaporation losses* that occur during the storage of volatile products. One authority* states that under proper supervision and with adequate facilities, the over-all unaccounted-for refinery loss should not exceed about 1.0% and an individual unit should be somewhat lower. One of the most effective means of preventing evaporation losses from flat-bottom storage tanks containing volatile products is to equip such tanks with Horton *Double-Deck* Floating Roofs!



The above photograph shows a close-up view of the sealing ring and hangers. One edge of the flexible material is attached to the top of the ring and the other edge is attached to the top of the deck. This picture was taken on an 80-ft. diam. Horton Double-Deck Floating Roof installed on a 35,000-bbl. tank at a pipeline station in Oklahoma.

WHILE the escape of hydrocarbons at a refinery is generally small percentage-wise—1.82 in a typical 5,000 bbl. refinery—it can represent an important dollar value which is vital to refinery earnings. The Horton Double-Deck Floating Roof, designed and built by Chicago Bridge & Iron Company, is used primarily to reduce evaporation loss and eliminate fire hazard from new or existing tanks 15 feet or more in diam. which store volatile products that do not boil at normal atmospheric temperature. It may be used at pipe-line stations, natural gasoline plants, cycling plants, tank farms, bulk stations and marine terminals, as well as at refineries.

The *double-deck* construction of the Horton Floating Roof provides an insulating air space over the entire liquid surface. This eliminates practically all boiling and increases the range of products that can be stored to advantage in tanks equipped with Horton Floating Roofs. Specially-constructed bottom deck vents all air from beneath the deck when the tank is first filled. The elimination of the air vapor mixture under the roof stops breathing losses and reduces corrosion. An improved fire-resistant seal (close-up view shown at the left) effectively closes the space between the deck and tank shell.

These features and many more help to make the Horton Double-Deck Floating Roof more efficient in preventing evaporation and more effective in reducing fire hazard and lowering maintenance costs. Write our nearest office for new Bulletin B.

●

**Percentage figures shown here are from article entitled "Refinery Losses" by George Armistead, Jr., Consulting Engineer, which appeared in the July 13, 1946, issue of The Oil and Gas Journal. Reproduced here by special permission.*

& IRON COMPANY

Chicago, 4	**2128 McCormick Building**
New York, 6	**3347-165 Broadway Building**
Cleveland, 15	**2204 Guildhall Building**
Los Angeles, 14	**1423 Wm. Fox Building**
Atlanta, 3	**2154 Healey Building**
Birmingham, 1	**1536 North 50th Street**
Tulsa, 3	**1606 Hunt Building**
Houston, 1	**5619 Clinton Drive**
Philadelphia, 3	**1615-1700 Walnut Street Building**
Washington, 4	**703 Atlantic Building**
San Francisco, 11	**1254-22 Battery Street Building**
Detroit, 26	**1514 Lafayette Building**

WATCHING WASHINGTON

(Continued from page 68)

national production. The war was won with the 99.9 per cent produced by private industry. Moreover, the Navy's production did not go directly to the Navy, but was dumped into the nation's total pool which was 100 per cent controlled by the Government and parcelled out to the Navy, Army, merchant marine, agriculture, trucking, and essential civilian uses.

The theory of a Naval petroleum reserve seems to be that after all other oil has been used up, after munitions factories have shut down for lack of oil, after cars, trucks and tractors have been stalled, after the merchant ships have been tied up, then the Navy can open its reserves and have enough oil to send its fleet out for the one last battle that might keep the enemy from our shores.

This theory may have been plausible in 1912 when oil was more important to naval strategy than to the industrial economy, but now it should be evident that in war the government controls the production and use of all commodities, petroleum is just as essential to the home front as to a fleet operation, and private industry is the nation's reliance for production of whatever is needed for war.

Big Inch Rumors Scotched

WAR ASSETS ADMINISTRATION took occasion last week to deny rumors that it has abandoned its policy of favoring disposal of the Big-Inch pipe lines for oil use rather than for natural gas, issuing a press release stating that no change is contemplated in the policy laid down by the report made to Congress last January by the Surplus Property Administration.

The deadline has now passed for all bidders to submit supplemental data, and the WAA staff is completing its analysis of the 16 proposals opened on July 31. However, considerable time probably will elapse before there is a final decision on disposal of the lines because of the complicated administrative machinery Administrator Robert M. Littlejohn has set up to guard against mistakes.

The Big-Inch bids are now in the hands of the utilities branch, which will submit its findings with or without recommendations for action. This report will go to the real property disposal board which will recommend specific action to the administrator. Before action, however, the matter will go to the real property review board, a group of outside experts being formed for the purpose of checking on the more important actions of the WAA staff and informing the administrator of possible repercussions from industry and the public. Finally, Littlejohn will refer big deals like the Big-Inch sale to the general review board, composed of seven engineers and economists responsible directly to him.

New Subsidy Regulations

NEW forms for use by crude-oil purchasers in collecting the stripper-well compensatory adjustment have been issued by Reconstruction Finance Corp. to conform with the 25-cent reduction in subsidy payments. Special instructions require information on changes in posted prices, changes in payment by gravity of crude, and statement that the amounts claimed have been paid to producers.

Another change plugs a loophole RFC discovered in the original regulations. When Office of Price Administration made up its first list of stripper-well fields entitled to subsidy it listed many of them as all fields in certain counties except those named. The new amendment prohibits collection of subsidy payments for oil produced from fields discovered in such counties since January 1, 1944.

Mississippi River Fuel's $11,574,000 Plans Approved

ST. LOUIS.—Mississippi River Fuel Corp.'s $11,574,000 program of additions to its Louisiana-Illinois natural-gas system has been approved by the Federal Power Commission, company officials here said this week.

The expansion work embraces a total of 265 miles of 22-in. loops and the addition of 10,200 hp. to existing compressor stations and will increase the delivery capacity of the system about 50,000,000 cu. ft. to 183,000,000 cu. ft. daily. Because of shortage of materials, work probably will not be finally completed until late next year, said William Marbury, company vice president.

CPA Outlaws Blends Giving Over 78.5 Octane

WASHINGTON.—Civilian Production Administration this week issued an amendment to its tetraethyl-lead order, L-355, prohibiting anyone from using ethyl fluid or gasoline containing ethyl fluid or blending with anything else to produce a motor fuel with octane value in excess of 78.5 rating.

The original order prohibited production of gasoline over 78.5 octane with the use of ethyl, and the amendment prevents raising the rating by subsequent processing. It does not affect the octane value of gasoline containing no ethyl fluid.

Bond, Renwar to Buy Richardson Petroleum

CORPUS CHRISTI, Tex.—A sales contract to purchase Richardson Petroleum Corp. of Corpus Christi for $6,000,000 was signed last week by Renwar Oil Corp. and Bond Oil Co., according to Guy I. Warren, head of Renwar.

The consideration will be $5,500,000 cash and $500,000 out of production, with the transaction being subject to engineering surveys, well tests, and title examinations which are expected to be completed in about 2 months. Part of the $6,000,000 involved will go to former Richardson stockholders and part to present stockholders, Warren said.

A special meeting of stockholders of Texas Gulf Producing Co. to consider merger with Fohs Oil Co. has been called for September 27, it was announced last week in Houston. The merger was approved by directors of the two companies August 2.

New Company Proposed To Wholesale Gas

PITTSBURGH.—Plans for a natural-gas pipe line extending from Louisiana to the Middle West area and the formation of a $21,000,000 wholesale gas company were revealed here last week by J. H. Hillman, Jr., president of Texas Gas Transmission Corp.

By means of stock transactions with Pennsylvania Industries, Inc., and Hecla Coal & Coke Co., Texas Gas would acquire all preferred and common stock of Kentucky Natural Gas Corp. and 49 per cent of the common stock of Memphis Natural Gas Co. The Memphis company operates a natural-gas pipe line from Louisiana to Memphis, while the properties of Kentucky Natural Gas are serviced by Panhandle Eastern Pipe Line Co.

Dallas Offices Opened

DALLAS.—Main offices of five oil companies have been moved here from Texarkana, Ark. The companies are: Nebo Oil Co., Inc.; Olla Oil Co., Inc., Little Creek Oil Co., Inc.; Bodcaw Oil Co., Inc.; and Grant Oil Co., Inc.

Normandie Sale Asked

LOS ANGELES.—Time Oil Co., Pacific Coast operators, have asked the U. S. Maritime Commission to offer the 83,000-ton French liner Normandie for sale to be used as an oil tanker for bulk storage in inland waters. The ship would be tied up and used as substitute storage space because of steel shortages.

Markets Hold Steady as Industry Moves into Transition Period

PETROLEUM markets generally held steady throughout the country last week as the industry moved into the normal transition period between the summer-winter demand seasons.

Although unusually heavy late vacation travel and fall farm activity kept motor fuel demand at a high level, market observers regarded the peak of summer gasoline consumption as ended following Labor Day. Trade circles were optimistic over indications the ultimate winter market in burning oils will match the record heavy peacetime gasoline movement this summer.

Some slackening of gasoline demand was reported in the Mid-Continent area, in California, and in New York. In the Mid-Continent area, gasoline was reported being offered somewhat freely at prices ranging upward from 6⅞ cents and without the buying pressure that existed in August. In New York gasoline demand was off slightly with prices unchanged.

Deep Rock Oil Corp. announced it is notifying its franchise distributors in the 11-state Standard Oil Co. of Indiana territory (except Indiana and the Lower Michigan Peninsula) that the marginal protection feature of its jobber sales contract will be increased from 2 cents to 2½ cents per gallon on regular grade gasoline.

Similar increases were reported being granted by other companies. Deep Rock said new contracts covering the change are being presented to jobbers for execution.

In the New York area residual and No. 5 were still tight but with some signs of improvement. The growing coal-to-oil trend in New York was emphasized last week with the disclosure four coal concerns are planning new bulk plants with a combined capacity of approximately 166,000 bbl. Some sources seemed to think the entrance of new fuel-oil suppliers may result in a cut in prices, particularly if the winter's anticipated demand is less than expected.

On the West Coast, the strike tieup of all dry cargo shipping last week precipitated a sharp decline in heavy-fuel-oil demand by the marine trade. Forunately, for refining companies, the maritime strike did not apply to tanker seamen who are covered by a more recent and separate working agreement. Exclusion of tanker crews from the shipping strike permitted normal movement of export, intercoastal and intracoastal cargoes.

Last weekend terminated the tourist season at many of the California mountain resorts and the start of school terms has been accompanied by a mild reduction in automobile travel. Reductions in tourist trade, however, are approximately offset by late vacations elected by those receiving delivery on new automobiles.

Texas A. & M. Holds Instrumentation Course

(Continued from page 67)

steps employed for factory testing motor valves.

D. M. Considine, Brown Instrument Co., presented his paper second on the Friday forenoon program. This paper, in general, dealt with the application of recording potentiometer apparatus to many of the modern analytical instruments such as the X-ray, ultraviolet, and infrared spectrometers and other apparatus employed in like services.

The question-and-answer session which consumed its allotted time Friday afternoon was attended by a large group eager for a solution to their various pet problems. Questions concerning characterized valves took up a large part of the period as well as received answers from most if not all of the panel. This session was presided over aptly by W. H. Fortney of Humble Oil & Refining Co.

Plans are already under way for the 1947 course, according to Dr. Murdoch. Additional space at the college will allow room for a larger exhibit of commercial instruments next year. This exhibit is expected to include a large group of analytical apparatus such as is employed in process control in both the petroleum and chemical industries.

Further Advances Posted For Pennsylvania Crudes

Joseph Seep Purchasing Agency, of South Penn Oil Co., has posted increases varying from 20 to 26 cents a barrel for Pennsylvania Grade crude oil in certain areas, it was announced last week. This action, retroactive to September 1, follows South Penn's earlier increase of 6 cents per barrel for Bradford and Allegany crudes.

Crude in Southwest Pennsylvania lines went up 20 cents, to $3.20; Eureka lines, up 26 cents, to $3.20; and in Buckeye lines, 26 cents, to $3.16. Waverly Oil Works also increased Zanesville grade crude in Buckeye lines 26 cents, to $2.86. Reconstruction Finance Corp. indicated subsidy payments would be reduced by the amount of any upward adjustments in crude prices.

West Texas Firm Divides Properties

MIDLAND, Tex. — Properties of York & Harper, Inc., in the Harper, Foster and Wasson fields of West Texas are being divided between owners of the concern, it was reported last week. Effective October 1, O. C. Harper will succeed R. L. York as president and the firm will continue operation under the name of York & Harper.

The company promoted the discovery wells in the Harper and Foster fields of Ector County and also in the old Wasson area. Officials of the company said headquarters would remain in the First National Bank Building.

DEATHS

John L. Yerdon, 77, president of J. L. Yerdon Co. and purchasing agent of United Refining Co., died September 2 at his home in Bradford, Pa.

Royal H. Brin, 62, retired oil operator of Dallas, died August 24 in Los Angeles.

Harry H. Hart, 52, auditor for The Texas Co., died September 4 at his home in Houston. He had been with the company since 1920.

Carl Hugh Beal, 57, geologist and member of the board of directors of Tide Water Associated Oil Co., died September 7 in Los Angeles. He was credited with discovery of Kettleman Hills field.

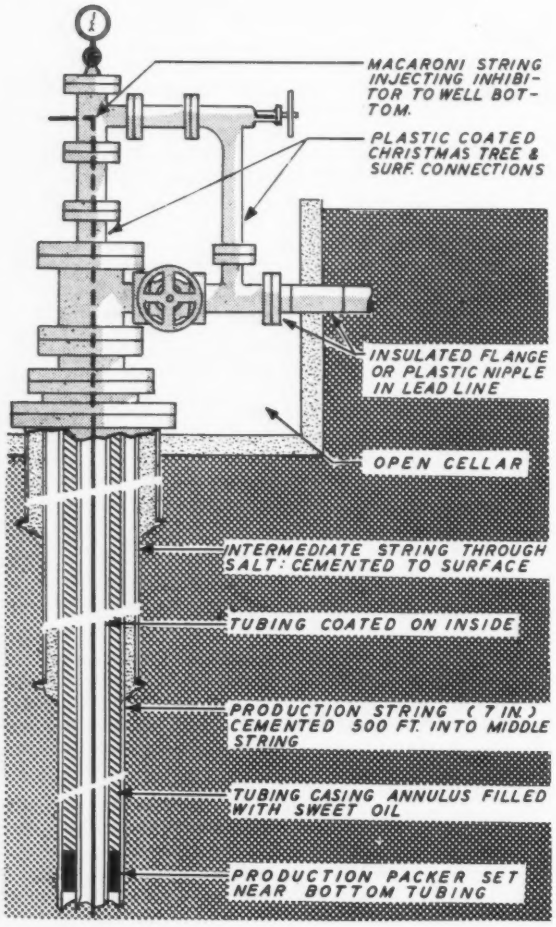
Lawrence W. Hewitt, 48, geologist for Socony-Vacuum Oil Co., Inc., died September 5 in New York. He also had been on the geological staffs of Continental Oil Co., Sinclair Refining Co., and Sunray Oil Corp.

Theodore Edward Tack, 64, vice president of American Oil Development Co., died September 9 at his home in Tulsa. He had been with the company since 1917, and previously had been active in Pennsylvania and Oklahoma fields.

George Edward Foster, 73, retired head of the material department of Barnsdall Oil Co., died September 8 in Tulsa.

The Permian Basin Fights Corrosion

by George Weber


MACARONI STRING INJECTING INHIBITOR TO WELL BOTTOM.
PLASTIC COATED CHRISTMAS TREE & SURF. CONNECTIONS
INSULATED FLANGE OR PLASTIC NIPPLE IN LEAD LINE
OPEN CELLAR
INTERMEDIATE STRING THROUGH SALT: CEMENTED TO SURFACE
TUBING COATED ON INSIDE
PRODUCTION STRING (7 IN.) CEMENTED 500 FT. INTO MIDDLE STRING
TUBING CASING ANNULUS FILLED WITH SWEET OIL
PRODUCTION PACKER SET NEAR BOTTOM TUBING

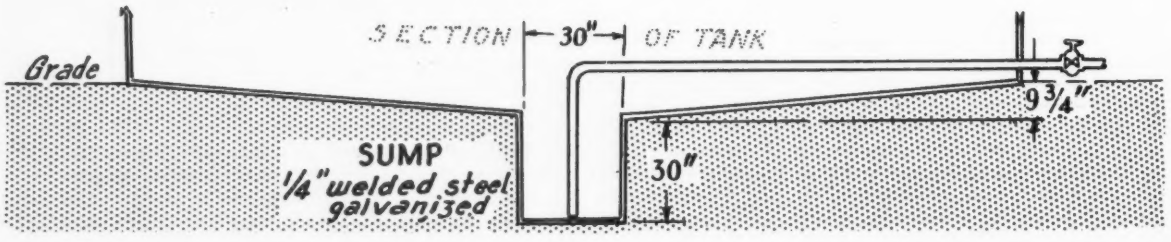
This article tells what operators in West Texas-New Mexico's Permian Basin are doing to combat corrosion. On page 88 of this issue an article by F. A. Prange of Phillips Petroleum Co. discusses still different aspects of corrosion of oil-field equipment. (Prange's "The A, B, and C of Corrosion" appeared in the Journal last week, page 88).

CORROSION, an old problem in West Texas and New Mexico, is currently receiving the concerted attention of a large number of engineers. The study, on a broad base of both theory and practical field experiment, concerns all types of corrosion encountered in that area, and promises an eventual saving of millions of dollars in equipment, labor costs, and lost production. As work progresses, the Permian basin should provide many proven methods and materials which will benefit the industry generally.

Two organized research programs are already under way. The American Association of Oilwell Drilling Contractors, through the services of Battelle Memorial Institute, is investigating the specific problem of drill-pipe corrosion. On a more comprehensive basis, all types of surface and subsurface corrosion excepting that named above, are to be studied by a corrosion subcommittee of the Lea County Operators Committee in New Mexico. This group, organized in April 1946, has the backing of its parent committee members and in addition, three state bodies; the Bureau of Mines and Mineral Resources, the Oil Conservation Commission, and the New Mexico School of Mines.

Fig. 1—(Left) Hypothetical West Texas or New Mexico well on which several corrosion control methods now in use or projected, are employed

Fig. 2—(Below) Section of conical bottomed 1,000-bbl. tank



Supplementing the work of these two groups, oil companies in general, partially relieved from wartime shortages of engineering talent, are directing increased attention to corrosion study. Some major oil companies have placed full-time corrosion engineers on the local problem.

Service-company engineers are contributing considerably to the program. New materials and chemicals are now available in increased variety and quantity and improved techniques and instruments for detection and inspection are being brought into wide use.

Although general solution of the complicated corrosion situation is still far off, progress is indicated on several fronts. Actual or threatened corrosion of casing is receiving much immediate study, since it is most difficult to remedy in its advanced stages. Little is yet known of its exact causes which undoubtedly vary with individual fields and wells.

An outstanding example of advanced internal casing corrosion is found in the Hobbs field of Eddy County, New Mexico. Production is from three main horizons at approximately 4,045, 4,085 and 4,150 ft., the upper two producing some water. A major oil company recently began a reworking program, intending to deepen several wells making water, set 5½-in. casing inside the original 7-in. strings, and perforate for production in the deepest sand. On pulling tubing in the first three wells it was found that corrosion above the gas-oil contact had severely attacked the outside of the tubing and inside of the casing. Mechanical calipers showed casing corrosion, but could not locate actual holes. Tubing and packer tests conducted down the hole in each well proved that some casing was corroded completely through.

Following this discovery indicating serious corrosion in other wells in the field, the company adopted measures to remedy the damage already done and to prevent its continuing. All wells showing casing leaks are being lined with 5½-in. casing. Then, following a practice adopted in the Magnolia field of South Arkansas, a production packer is set near the bottom of the tubing string, and the annulus between tubing and casing is filled with sweet, refined gas oil. The same program, except for lining of the 7-in. casing, is followed for wells not yet showing casing leaks.

Whether caused by chemical or electrolytic action, corrosion will be halted by the static oil column. At first crude oil was used to fill the annulus but since such oil is sour and contains as much as 1 per cent of water it would require treating before being considered entirely safe for such use. The small additional cost of gas oil was considered worth the complete protection it affords.

A total of 14 flowing wells at Hobbs have been reworked in this manner, and the company has scheduled 8 more for immediate attention. In addition, key wells throughout the field which are flowing at high gas-oil ratios and making water are being calipered, and if indicated corrosion justifies remedial work, it will be undertaken. On the basis of what was learned at Hobbs, the company is investigating wells in other fields. This survey is considered particularly important in fields like Wasson, where wells are set with 5½-in. casing, precluding their lining if corrosion is allowed to reach advanced stages.

Other companies are beginning to follow this practice. At Fullerton, one company is adopting such preventive work on new wells just completed. The situation is tending to reverse the recent trend to slim holes, and some operators are considering adoption of 7-in. production casing programs to allow future remedial work if required.

On the theory that a static column of any noncorrosive fluid will halt corrosion, some engineers are using mildly sour oil and in some cases caustic mud for insulating the annulus. Mud is considered risky in low-pressure wells, since a packer leak might result in the mud killing the well.

If little is known of actual inside corrosion of casing, still less is known of its action on the exterior. As safety measures, some companies are cementing the intermediate string all the way to surface and setting cement outside the production casing 400 to 500 ft. up into the intermediate casing. In addition to protecting the string from possible corrosion of subsurface water, a completely cemented casing string is considered by some engineers as preventing incipient corrosion in areas of casing stress opposite the top of the cement outside the string.

The inexpensive practice of insulating flow lines at the well head is becoming widely followed. This is

(Continued on page 103)

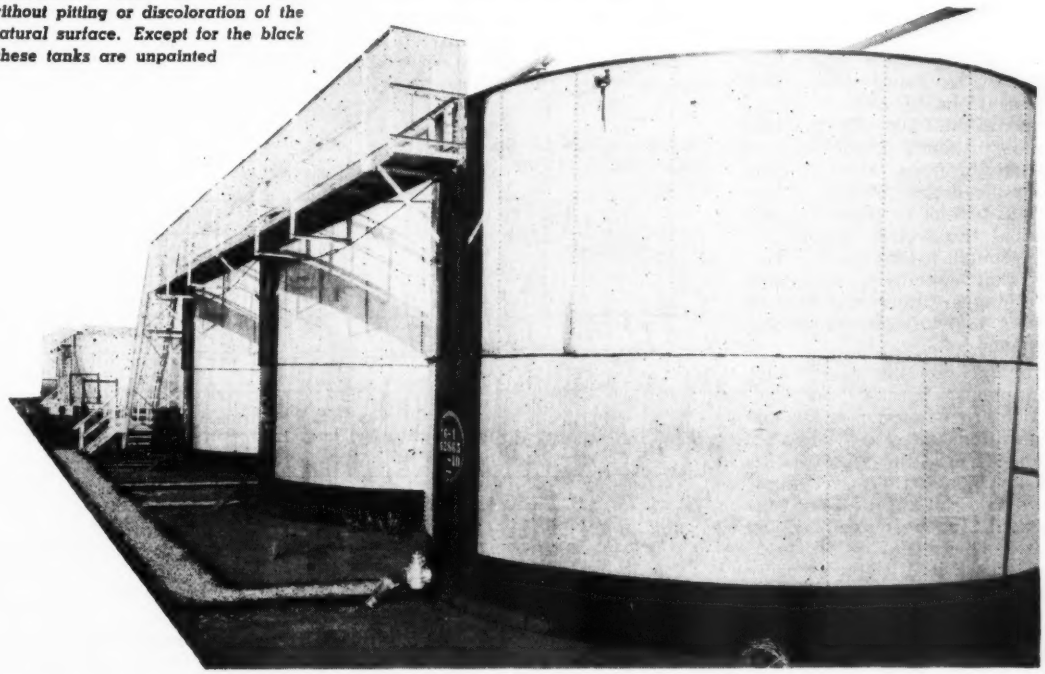


Fig. 3—Aluminized steel tanks in use in the Fullerton field, West Texas. Such tanks have withstood sour crude and water for 2 years without pitting or discoloration of the bright natural surface. Except for the black bands these tanks are unpainted

The Effects and Corrections Of Gas-Pulsation Problems

by Foster M. Stephens*

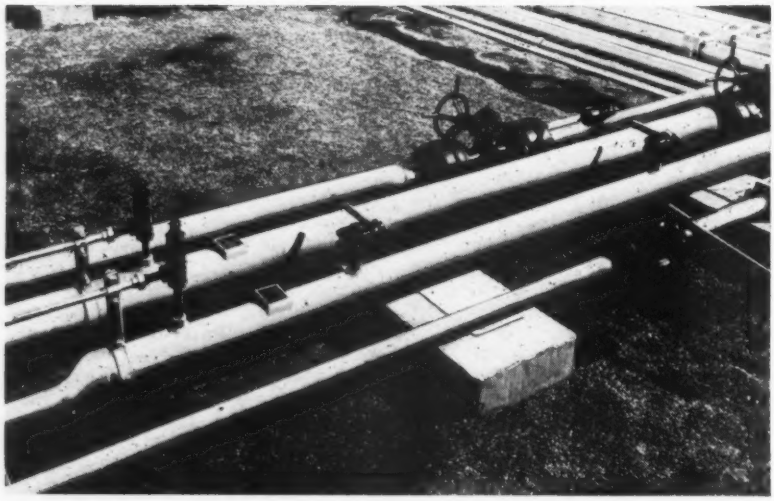


Fig. 1—Pulsation dampeners installed on 4,000 and 1,500 psi. high pressure discharge headers at a major oil company's cycling plant

THERE are many secondary effects of pulsative gas flow which are usually more easily recognized than the original source itself. One of these is vibration, which is often objectionable in gas-compression plants, refineries, gasoline plants, recycling plants, or in most cases where gas, air, or steam is being compressed. There seem to be no pressure ranges from vacuum to 5,000 psi. that are free in all instances from line and equipment vibrations. Many factors enter into the degree of pipe vibration, such as type of supports, spacing, and whether the system is overhead or on the ground. It likewise has been observed that expansion loops and general piping arrangements may be contributors to excessive vibrational displacements.

Unfortunately, for the sake of pipe and equipment, excessive accelerations, which are a function and measure of vibrational stresses, can often be measured where the piping is securely fastened and there is a minimum of visible shaking present. This has particularly been noticed in some cases where expansion loops are placed horizontally and securely clamped. In many instances the results of the continuous acceleration stresses results in shearing of the bolts in the pipe clamps or shattering of the concrete pipe supports. Usually compressor discharge lines are worse offenders than compressor suction lines as far as mechanical vibration is concerned. There are of course exceptions to this which may be caused by mechanical or acoustical resonance in the suction system.

Aside from vibrational effects, pulsative flow is a chief contributor to inaccurate orifice metering, resulting in errors in excess of 20 per cent in some instances. Phenomenal cases have even been reported in which the meter showed the gas to be flowing in a reverse direction from the actual flow. These metering errors are often experienced regardless of whether the meter run is located on the suction or discharge side of the compressor. Remote locations of metering stations from the compressor station do not always solve the metering problem, for there are many times when the pulsative flow is known to be present in the gas stream many miles from the compressor station.

Accurate Reading Sometimes Difficult

Pressure-gage readings fall into the same pressure-fluctuating disturbances as meters and there are many instances when it is practically impossible to get an accurate pressure reading in the proximity of a compressor station due to the gage responding to the pressure pulsations.

Horsepower loss due to pulsative flow represents an exceedingly complicated story when considered from all angles. On the discharge side,

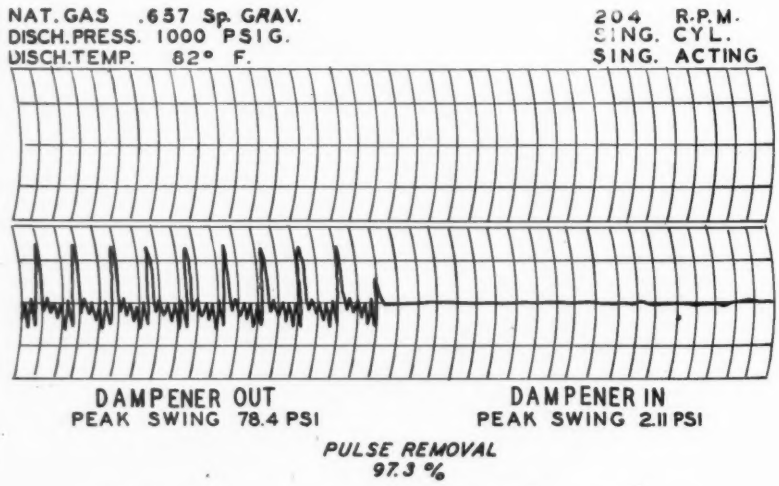


Fig. 2—Chart made from an experimental pulsation dampener hookup in the Fluor research laboratory pilot plant; suction side of compressor

*Principal Research Engineer, Development department, The Fluor Corp., Ltd., Los Angeles.

high instantaneous pressures may be produced in compressor cylinders because of discharge-line pulsations. This often occurs when several compressors are operating in tandem and discharging into a common header. Likewise reflections can be produced from pipe bends, valves, or other abrupt changes in gas-flow conditions. The result of this type reflection is again that of high instantaneous peaks.

Another horsepower loss is the extra pressure drop required to drive a pulsative flow through a transmission line. Due to the high instantaneous velocities achieved at the pulse peak, the pipe frictional effect is in excess of what would be encountered for a steady flow.

On the suction side of the compressor, pulsations can create cylinder starvation at one instant and a supercharged condition the next instant. Cases have been observed where engine-speed hunting was so bad that it was impossible to operate all engines at the same time.

There naturally have been corrections applied to many of the previously described problems as they appeared in the field, resulting at least in partial solutions to the problem. Many of these corrections have been by trial and error and therefore do not represent a universal solution.

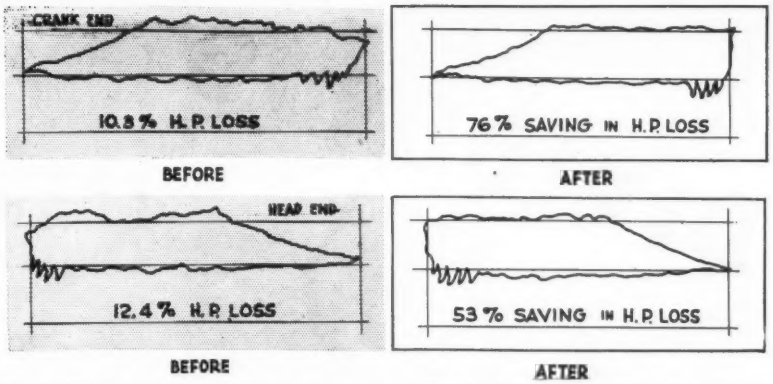


Fig. 4—These horsepower-indicator cards were made at a large southwestern gas company plant before and after installing Fluor pulsation dampeners. Considerable horsepower savings were effected on both the crank and head ends of the compressor after the pulsative flow was eliminated

In the case of pipe vibrations, various arrangements of piping have been tried and while it is beyond the scope of this article it may be said in general that some are decidedly better than others in this respect. The usual procedure when excessive vibration displacements are observed has been to tie down the points of excessive displacements structurally. There have been occasions when this resulted in a shift of the point of maximum displacement to some other part of the piping system, thereby creating the necessity for additional structural supports. In many instances it has been necessary to repeat this procedure several times before the entire problem was corrected. In this connection it should be pointed out that it is virtually impossible to predict and space piping supports in such a manner as to be nonresonant to all the varying frequencies and beat frequencies of pulsation that may result from several compressors running at varying speeds and discharging into common header. For a single compressor running at fairly constant speed, however, there are certain predictable pipe spans that should be avoided and these can be calculated with a fair degree of accuracy.

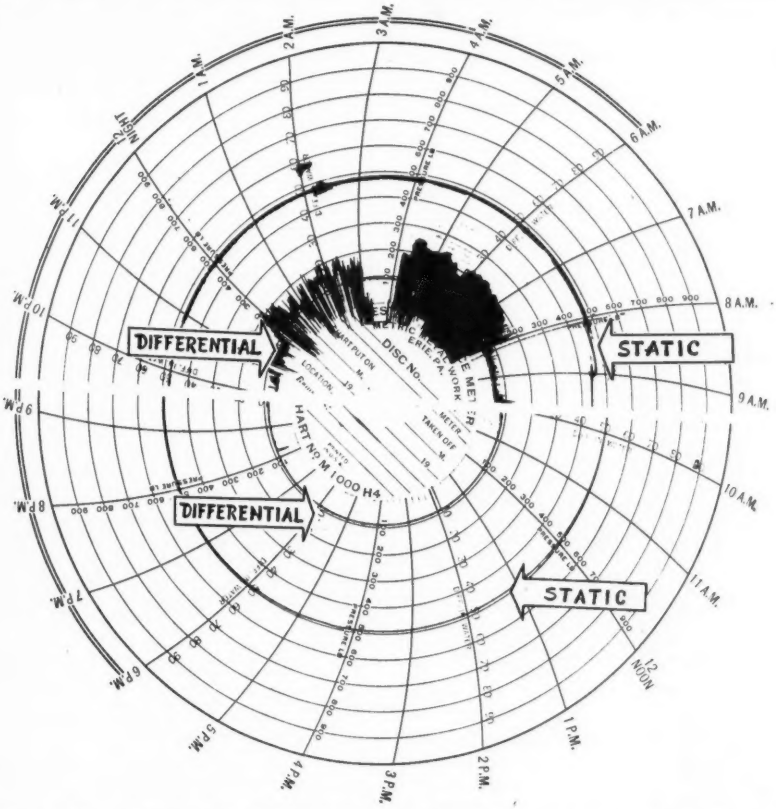


Fig. 3—The upper one-half is a recording orifice meter chart at a large southwestern gas company's plant before a pulsation dampener was installed. The lower one-half is the same orifice meter's chart after dampener installation

Mechanical Vibrational Dampeners

Another method has been utilized in recent years for decreasing the magnitude of piping vibration. It consists of installing mechanical vibrational dampeners at certain strategic spots in the piping system. These mechanical dampeners have been made in various forms. They usually consist of combinations of weights and springs, weights and rubbers, or just springs. The principle employed by these devices is that of changing the natural frequency of the vibrating member or of absorbing the vibrational energy by being resonant to the vibrational frequency. The disadvantages of these devices are that usually they are only a partial cure for the trouble, and require exact location and adjustment to be effective.

To keep metering errors at a minimum, many systems have been used. The simplest of these consists of pinching valves in the meter lead lines. In some instances volume chambers and even orifice plates have been installed ahead of meter runs. To summarize these procedures it may be stated that they at least

(Continued on page 102)

from FURNACE DRAFT

by Robert Reed*

Neglect of furnace draft and the details of furnace and burner operating details results in high furnace-maintenance cost, fuel waste, danger of personnel injuries, and damage to process conditions. Accurate draft indication is difficult to obtain in areas of high winds. This article shows in detail how a representative average furnace pressure indication may be had at all times when high winds prevail. Reduction of excess air is necessary to obtain the best operating results; pressure on furnace arch results in damage and less efficient operation.

A TOOL, no matter how fine it may be, is never better than the manner in which it is employed. Furnace draft is a tool especially provided by natural laws for use by operators of all types of furnaces. Properly used this tool is capable of producing dividends but when it is misused much loss is to be expected.

It is probable that no single element involved in the operation of furnaces is more neglected than the observation of draft conditions and effects. The neglect may stem from pressure on operators for maximum production of products regardless of furnace and stack limitations; also it may be due to lack of understanding of what can happen because of the neglect.

Some of the results of neglect of draft are:

1. Extremely high furnace-maintenance costs.
2. Unwarranted waste of fuel.
3. Danger of serious injury to operating personnel.
4. Serious impairment of process conditions.

The first citation may be attributed to pressure greater than atmospheric at some place in the furnace, usually at the arch or at the highest point inside the furnace, while the other three may result from either pressure or too much vacuum.

It is a little difficult at times to make it clear to the operator that a vacuum may exist in the lower portion of the furnace or at the level of the burners while at a point higher in the same furnace a condition of plus-atmospheric pressure can exist. Such conditions can and do exist unless great care is taken in draft regulation.

*Engineer, John Zink Co.

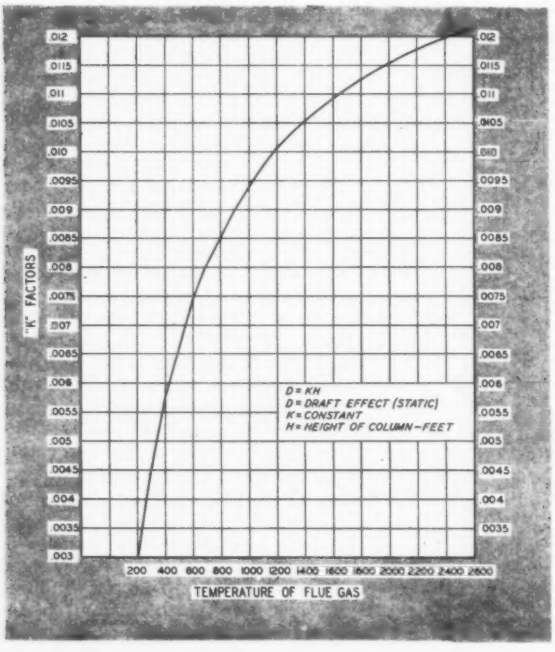


Fig. 1—"K" Factors for draft obtainable from heated columns of gases, as in a furnace stack

Fig. 1 is a curve to show the draft effect of heated columns of flue gases at various temperatures. The curve reveals the amount of draft per foot of height. The K factors are nothing more than the draft to be obtained from a column 1 ft. high at temperatures ranging from 200° to 2,600° F. with the draft being shown in fractions of an inch water column.

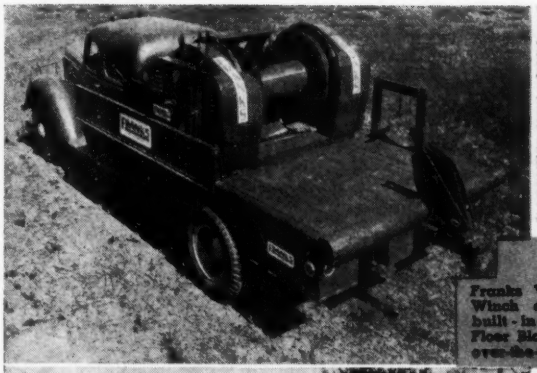
Using the curve makes it easy to determine the amount of vacuum which must be maintained to avoid a condition of pressure at any place in the furnace. As an example: consider a furnace in which draft indications are taken at a point 12 ft. below the arch; a furnace mean temperature of 2,000° F. and presume a draft of 0.02 in. H_2O is to be maintained at the arch to avoid pressure.

From the curve on Fig. 1 we see that the K factor for 2,000° is 0.0115. We see also that D or draft is equal to K multiplied by H or the height of the column. H in this case is the difference between the elevation of the point at which the draft is taken and the arch, or 12 ft. Therefore, 12 times 0.0115 equals 0.138 in. H_2O or the difference in pressure existing between the point where the draft indication is made and the arch or highest part of the furnace.

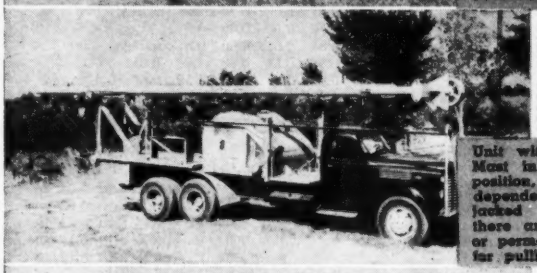
Since we want to maintain a vacuum of 0.02 in. at the arch we must add this to the difference in pressure due to temperature of the 12-ft. column of flue gases at 2,000° to get a total of 0.158 in. H_2O. This is the draft which should be shown by the gage on the furnace taken as an example.

Again considering the furnace taken as an example: If the draft gage should show only 0.10 in. H_2O it is inevitable that a plus pressure of 0.038 in. H_2O must exist at the arch (0.138 in. — 0.10 in. = 0.038 in.).

Furnace mean temperature may be taken as an average of combustion temperature and bridge-wall temperature. Under average conditions of excess air the combustion tempera-



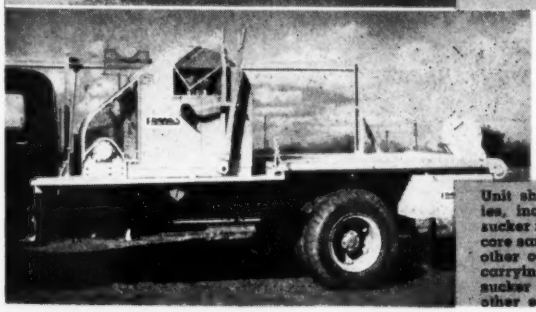
Franks Well Servicing Winch equipped with built-in Telescoping Floor Block (Stinger) in over-the-road position.



Unit with Telescoping Mast in over-the-road position, for use on independently-pumped or jacked wells where there are no derricks or permanent facilities for pulling.

Franks Well Servicing Winch showing Rotary Drive Attachment.

Mast sizes to fit any load from shallow to deep territory. Mast can be raised in position to pull 5 minutes after arriving on location.



Unit showing accessories, including rack for sucker rods, tool boxes, core sample boxes, and other compartments for carrying well pumps, sucker rods subs and other equipment.

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ture may be presumed to be 2,400° F. A concensus of operators and furnace men would probably set draft at the arch at 0.02 in. H_2O minimum.

In some furnaces draft gages are manifolded to permit checking the furnace conditions in a number of places with a single gage. Connections may be provided at the burner level, the arch, the breeching and the stack. Such an installation is very good if used properly; however, such an arrangement is to be found in all too few instances. Most furnaces have provision for draft indication at a single point which is usually at or near the level of the burners.

Where the draft gage is manifolded it should be left connected to the arch point so that the fireman in his rounds may check it from time to time to see that no pressure exists in the furnace. Where only a single point is to be checked with the gage this point should be at the arch or in the highest part of the furnace. If the gage has already been installed for checking only at the level of the burners then the curve in Fig. 1 should be used to determine the minimum draft indication which is to be considered safe as in the example set forth.

For all practical purposes sufficient draft will exist at the level of the burners when the draft at the arch is maintained at 0.02 in. H_2O. The draft at the burners will, of course, be governed by the temperature inside the furnace and the height of the furnace. If, however, the furnace should be quite low it may be necessary to hold more than 0.02 in. H_2O at the arch in order to provide sufficient draft at the burner level for induction of air for combustion. In such a low furnace the minimum draft should be determined by testing with the Orsat flue-gas analyzing apparatus.

Burners are usually sized in keeping with the nature of the furnace and the burner manufacturer will usually provide burners amply large for the furnace.

Factors Involved in Design

A number of factors are involved in furnace-draft design. A furnace usually is made up of a radiant section which is in the furnace proper; a convection section in which the tubes are behind a bridge wall or other structure designed to prevent transfer of heat to the tubes by direct radiation; a breeching; a damper, and a stack. The flow of gases is from the furnace through the convection section then through the breeching and past the damper en route to the stack where the gases are discharged to the air.

All portions of the furnace are constructed with a certain maximum capacity in mind so far as excess air for combustion and amount of heat released are concerned. Pressure drop is required to obtain flow through the portions of the unit. The stack is the prime source of energy to overcome the pressure drop.

A stack of given size and height will produce a given vacuum when flue gases resulting from a given heat release and excess air flow upward through it. Table 1 shows the amount of draft which may be realized from stacks under the conditions as set forth on the table. The draft which is available from the stack may be used to overcome pressure drop through the breeching, past the damper, and through the convection section. The damper is provided to avoid placing too great a draft on the furnace if the stack is pulling more draft than is needed. Draft figures for stacks are decidedly empirical and some error may be found in the table; however, the table has been checked many times and to date the maximum error as found is 0.03 in. H_2O, which for all practical purposes is negligible.

With further reference to the table: Excess air greater than 40 per cent will produce less draft while excess air less than 40 per cent will produce more draft. Correction factors for stack temperature are provided.

It is universally recognized that the stack is the key to draft conditions in the furnace. If the stack is inadequate the draft condition cannot be good. If a furnace designed for

TABLE 1—AVAILABLE DRAFT IN INCHES OF WATER IN STACKS

Heat release 40% excess air	Diameter of stack in feet														
	3	3½	4	4½	5	6	7	8	9	10	11	12	13	14	15
	Available draft in inches W.C. 100-ft. stack at 500° F. Atmospheric temp. 80° F.														
7,500,000	0.60	0.61	0.61												
15,000,000	0.54	0.58	0.60	0.61	0.61										
22,500,000	0.44	0.53	0.58	0.60	0.60	0.61									
30,000,000	0.30	0.47	0.55	0.58	0.59	0.61									
37,500,000	...	0.38	0.51	0.56	0.58	0.60	0.61								
45,000,000	...	0.28	0.46	0.53	0.56	0.60	0.61								
52,500,000	...	...	0.40	0.50	0.54	0.59	0.60								
60,000,000	...	...	0.33	0.46	0.52	0.58	0.60	0.61							
67,500,000	...	...	...	0.42	0.50	0.57	0.60	0.61	0.61						
75,000,000	...	...	...	0.37	0.46	0.56	0.59	0.60	0.61						
82,500,000	...	...	...	...	0.40	0.53	0.58	0.60	0.61						
90,000,000	...	...	...	...	0.32	0.50	0.57	0.59	0.60	0.61					
97,500,000	...	...	...	...	...	0.48	0.55	0.58	0.60	0.61					
105,000,000	...	...	...	...	...	0.42	0.53	0.57	0.59	0.60					
112,500,000	...	...	...	...	...	0.37	0.51	0.56	0.58	0.60	0.61				
120,000,000	...	...	...	...	...	...	0.46	0.54	0.57	0.60	0.61	0.61			
127,500,000	...	...	...	...	...	...	0.40	0.52	0.56	0.58	0.60	0.61	0.61	...	...
135,000,000	...	...	...	...	...	...	0.33	0.47	0.54	0.57	0.59	0.60	0.61	...	...
142,500,000	...	...	...	...	...	...	...	0.43	0.50	0.56	0.58	0.60	0.60	0.61	0.61
150,000,000	...	...	...	...	...	...	...	0.38	0.48	0.54	0.58	0.59	0.60	0.61	0.61
180,000,000	...	...	...	...	...	...	...	0.30	0.42	0.45	0.56	0.58	0.59	0.60	0.60
210,000,000	...	...	...	...	...	...	...	...	0.36	0.51	0.55	0.58	0.58	0.59	0.60
217,500,000	...	...	...	...	...	...	...	...	...	0.45	0.53	0.56	0.57	0.58	0.58

For 60° F. atm. temp. add 0.05 in.
For 100° F. atm. temp. subtract 0.05 in.
For 350° F. stack subtract 0.14 in.
For 400° F. stack subtract 0.09 in.
For 450° F. stack subtract 0.04 in.
For 550° F. stack add 0.04 in.
For 600° F. stack add 0.08 in.
For 650° F. stack add 0.11 in.
For 700° F. stack add 0.14 in.
For 750° F. stack add 0.17 in.
For other heights, drafts in direct ratio.

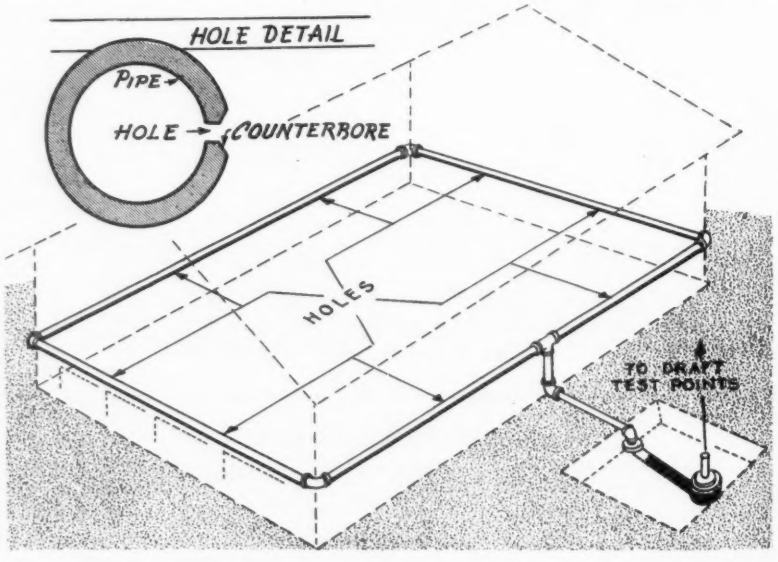

Fig. 2—Outline of system for obtaining correct average pressure in furnace, especially under high-wind conditions

a certain duty is loaded up until it is handling more than design the operator is at the mercy of the stack for the maintenance of good conditions. If the stack has been overdesigned and the additional duty can be handled by opening the damper the operator is fortunate, but if with the damper wide open he finds it impossible to keep pressure off the furnace he is confronted with the problem either of reducing duty on the furnace or continuing knowing that maintenance costs on the furnace will increase greatly.

Maintenance costs will increase because with pressure on the furnace the hot gases flow upwardly through the furnace structure to overheat the steel which supports the arch and perhaps the walls. The steel yields to cause the arch to fail while warpage and distortion caused by the heat make both arch and walls unstable.

One of the most serious results of pressure on the furnace may well be injury to operating personnel because of the outward flow of extremely hot gases from peep holes and other openings in the furnace structure.

In the absence of a draft gage or other means of indicating furnace pressure the operator may be sure that pressure exists in his furnace when he can see that the joints between the bricks in the furnace are hotter than the bodies of the bricks. Such a temperature condition may always be observed when pressure exists. If a vacuum exists the bodies of the bricks will be hotter than the joints, thus air leakage into the furnace may be identified when the joints are cooler than the bricks.

In areas where high winds are to be expected and where the furnace is in an exposed position accurate draft indications are very hard to get. High wind produces a condition of pressure on the side of the furnace exposed to the wind while the downstream side of the furnace will have a condition of partial vacuum. Differences of as much as 0.15 in. H_2O pressure have been noted between the windward and the leeward sides of furnaces in fairly moderate winds. Such a condition makes it almost impossible to get accurate draft indications unless steps are taken to correct for the difference in pressure on the various sides of the furnace.

A suggested corrective measure is that shown in Fig. 2. The manifold which encircles the furnace has 1/16-in. holes drilled about 10 ft. apart or with the same number of 1/16-in. holes drilled in the pipe on each side of the furnace. The atmospheric connection of the draft gage is connected into the manifold at a point halfway between any two 1/16-in. holes in the pipe. The small holes permit balancing pressures on each side of the furnace to approximate true atmospheric condition with minimum flow inside the manifold. The furnace condition is then checked against a fairly true atmospheric condition; however, when high winds are to be contended with the draft at the arch of the furnace should be kept slightly higher than normal to avoid excessive outward flow on the down-wind side of the furnace where a partial vacuum exists because of the wind flow over the furnace. The manifold should be made of ½-in. or larger pipe. The 1/16-in. holes should be checked from time to time to see that they have not corroded to the point of closure.

Furnace pressures may be controlled in two ways. They are by regulation of the damper or by regulation of the secondary air control portions of the burner registers. It may be necessary to regulate both to get optimum conditions.

If, for instance, with a fixed damper setting the furnace draft is too low the draft in the furnace may be increased by partial closure of the secondary air-entry area. If such an adjustment can be made to get the required furnace-draft condition without too great reduction of excess air it will be unnecessary to adjust the damper. If, however, the closure of the secondary air openings should result in too little excess air it will be necessary to open the damper and increase the furnace draft to such a point that sufficient air is drawn in through the reduced secondary air-entry area. A little experimenting will soon produce the required result provided the stack is capable of producing sufficient draft.

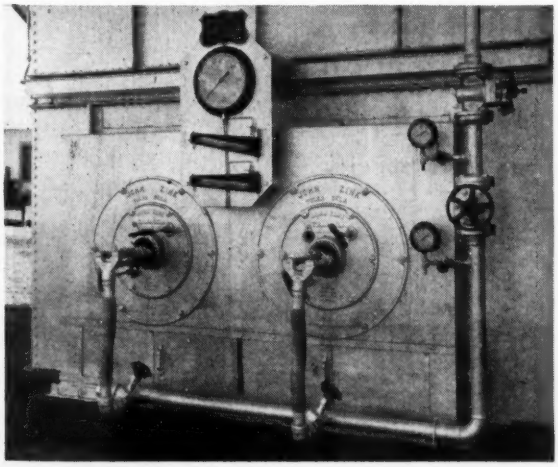

Fig. 3—Good draft characteristics are obtained in this steam-generator installation in a Texas recycling plant

Much fuel may be lost through failure to observe draft conditions inside furnaces. The loss may result from either too much or too little draft. If too little draft is the case heat is lost in the flow of hot gases from the furnace. If too great draft is present the heat loss results from excessive infiltration of air into the furnace. This infiltration is especially bad in some oil heaters because cold air flows over the ends of the tubes and the headers after first being drawn inside the header boxes.

An outstanding example of heat loss through furnace pressure was found in a steam power plant in a Gulf Coast refinery. The furnaces had been designed to permit the burning of powdered coal if it should be necessary to do so and were, accordingly, quite high. The burners had been sized for normal furnace height and were too large. With the secondary air-entry area set for normal operation with the draft which existed in the high furnace there was not sufficient draft at the burner level to maintain optimum draft in the highest part of the furnace. A pressure of approximately 0.12 in. H_2O existed there.

Fuel-Flow Drop

When the secondary air openings of the burners on this furnace were reduced to raise the furnace vacuum or draft and maintain draft in the highest part of the furnace the fuel flow dropped 3 per cent with the same production of steam and the same excess air.

Some operators who may have had years of experience will assert that a furnace will not deliver full duty if they do not adjust their furnace draft to maintain pressure in the furnace. The operators are correct in their assumption that with the draft adjusted as they specify they are able to handle a greater volume of material, but they are incorrect in assuming the furnace pressure, as such, permits them to do so. The increased duty results from reduction of excess air which is, in turn, a factor of furnace draft.

When pressure exists at the arch of the furnace there would be proportionally less draft at the level of the burners. With a fixed secondary air-entry area the existence of draft at the arch may raise the draft at the level of the burners to such a point that excess air goes too high and the process suffers. If, however, the secondary air-entry area is reduced to maintain the required excess air with the increased furnace draft, process conditions and volume will be entirely satisfactory as has been proved in a number of cases.

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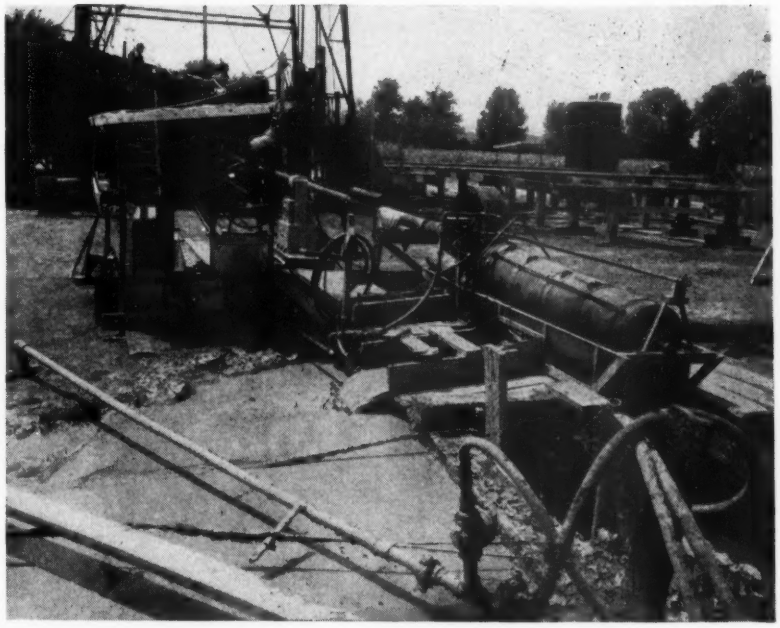
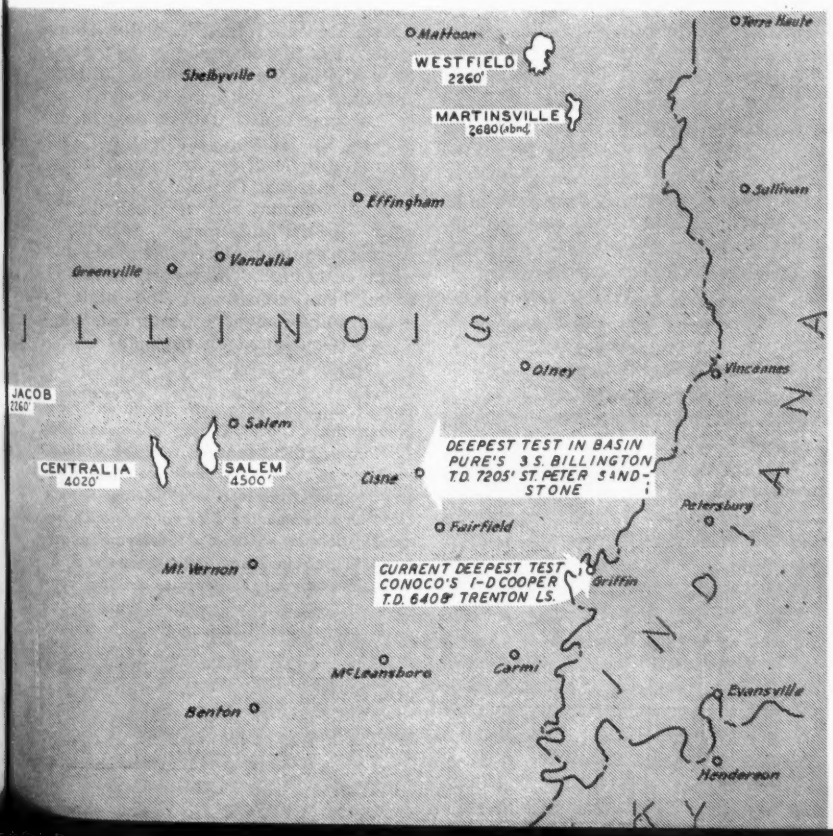
Deep Development in Illinois Basin Poses Drilling Problems for Operators

by Neil Williams

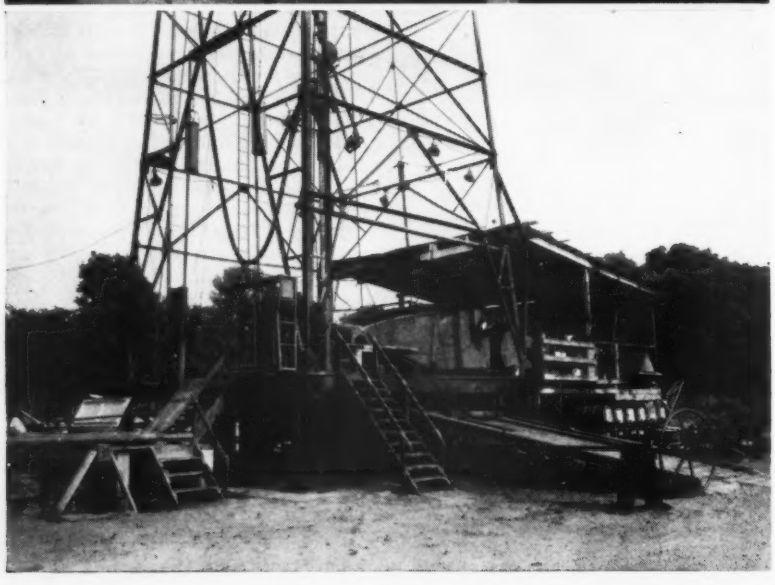
ONE of the chief remaining potentialities for development in the Illinois Basin, comprising a large area of southern and southeastern Illinois, southwestern Indiana, and northwestern Kentucky, lies in the exploration of possible productive horizons of Ordovician and Cambrian age. The Ordovician long has been a prolific source of production in the Mid-Continent Oklahoma and Kansas region, and during the last several years has been the objective of a widespread drilling play in the Permian basin of West Texas and New Mexico where extensive petroleum reserves already have been proved in it. So far, no production of this age has been found in the Illinois Basin proper, and only a small amount in a few fields around and along its marginal limits. However, the formation is known to be present over a wide area with various porous limestone, dolomite, and sandstone members of marine origin favorable for the accumulation of oil, and since no general exploration has been made, prospects of finding important production in it are considered hopeful.



The lowest horizon in which any wide-scale development has been carried out and production obtained has been the McClosky lime in the upper part of the Iowa (Lower Mississippian) series. At its deepest places this has been found at depths no greater than 3,000 to 3,500 ft. The St. Louis and Salem and Osage groups in the lower part of the Iowa series, and also the underlying Devonian and Silurian sections, have been tested in quite a few places, and in a number of fields some production has been obtained from these horizons. Generally, however, where these formations have produced, the depths have



Above: Close mud control was an important phase of operation in Continental Oil Co.'s deep test. Lean-to, left, housed complete testing facilities. Mud screen, right, is equipment not generally used in Illinois-Indiana area. At right of lean-to is gas-detector installation on mud-return line. Left: Map showing location of Continental's new Trenton deep test and fields around Illinois basin where Trenton production already has been developed



been little more than those of the deepest McClosky.

Uppermost prospective member of the Ordovician is the Trenton (Kimmswick) lime, comparable in age with the Viola lime of the Mid-Continent. So far, it has been productive in only seven Illinois and two Indiana fields, which are located either outside the basin or in the marginal area along its rim, the formation is found at relatively shallow depths, the deepest being at Centralia, Clinton County, and Salem, Marion County, Illinois. Both the latter two fields are on the northwestern edge of the basin with the Trenton being found in them at 4,020 and 4,500 ft., respectively. Towards the center of the basin, it dips to depths up to 6,300 ft., possibly deeper at places.

Below the Trenton, at the base of the Ordovician, is the St. Peter sandstone, which correlates closely with the prolific Wilcox sand of Oklahoma. In none of the tests so far drilled to this horizon has there been any indication of commercial production, but in them it has been found as a well-developed sand phase. In the deeper part of the basin its exploration probably will call for drilling to depths of 7,000 to 7,500 ft.

Most Ordovician exploration to date has been limited to those places where the above formations might be expected at depths above 5,000 ft. Relatively few tests have been drilled below 5,500 ft. Only two or three have been carried below 6,000 ft., although one of these went to a total depth of 7,209 ft. The latter, drilled in 1944, was Pure Oil Co.'s 3 Stella Billington, located in the Cisne field, Wayne County, Illinois, where it tested the St. Peter sandstone. It is the deepest test in footage ever drilled in the entire Illinois, Indiana, and Kentucky district.

Problems confronted in deep drilling in the Illinois Basin have discouraged general exploration of these lower horizons. Unusually hard formations encountered at these depths slow up drilling speeds, materially increase equipment requirements and make costs high. These costs probably have been considered too high to warrant extensive development, con-

(Continued on page 98)

Top: H. L. Kruckeberg, left, Baroid sales engineer, and "Curly" Clark, toolpusher, Ed. F. Moran, drilling contractor, check drilling-mud records on Griffin pool deep test. Center: Because of lack of height below derrick floor to accommodate blowout-preventer assembly, it was necessary to elevate rotary table 4 ft. above floor. At the brake is R. R. Ross, driller, Ed F. Moran, drilling contractor, Continental's deep test. Bottom: Ed. F. Moran rig on Continental deep test in Griffin field, Indiana. Standard derrick is not conventional for Illinois-Indiana operation

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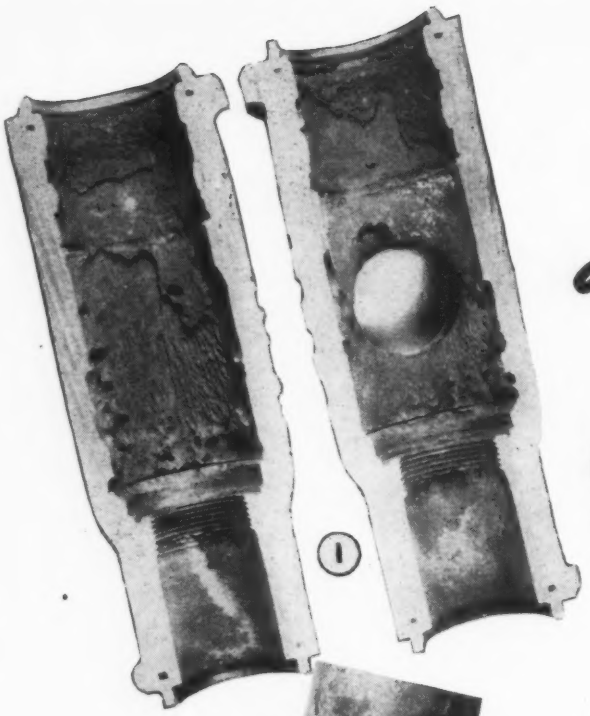
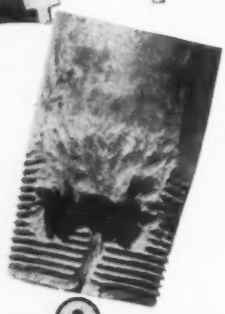
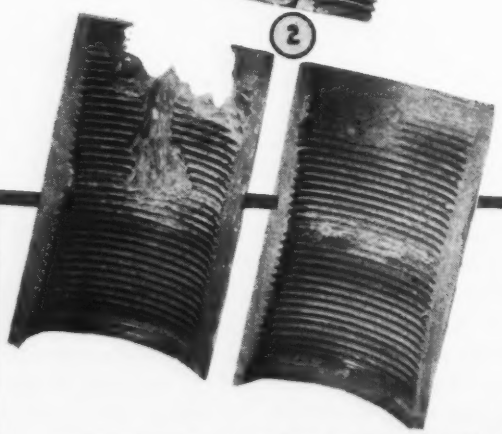
Learn the A, B, Cs of corrosion if you would get

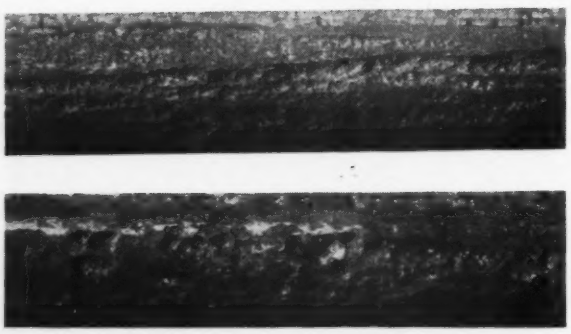
Longer Life from Your Equipment

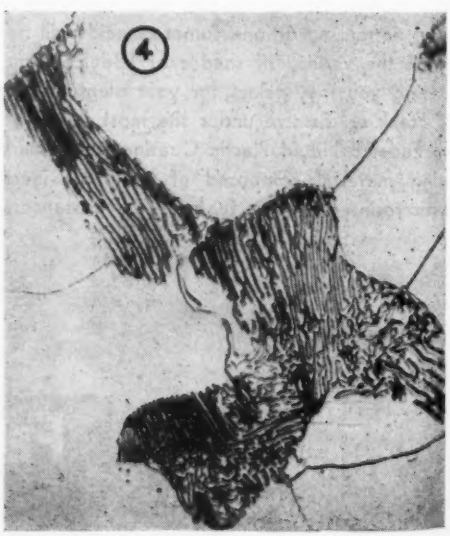
by F. A. Prange *











1—Corrosion-erosion in a choke body used on a distillate well producing a gas with approximately 1 per cent CO_2

2—Corrosion-erosion at a leaky joint

3—Pitting of sucker rods

4—1,500X magnification of pearlite grain surrounded by ferrite grains

WHEN dissimilar metals are coupled together in an electrically conductive solution which is corrosive to one or both of the materials, accelerated corrosion may occur. The greatest danger of coupling dissimilar metals is that a sharp band of localized corrosion may occur. As an example, instead of taking an ounce of metal uniformly off 10 sq. in., this bimetallic corrosion may take an ounce from one and leave the other nine unattacked.

High over-all rates of metal loss in bimetallic corrosion are favored by high conductivity, since the corrosion is governed largely by the magnitude of the currents involved. The influence of the bimetallic couple may extend over several feet in highly conductive solutions (like

*Phillips Petroleum Co., Bartlesville, Okla.

oil-well brines); but does not extend over hundreds of feet, as is sometimes claimed. In solutions of low conductivity the affected region will be small and the band of accelerated corrosion very sharp.

Dissimilar metal combinations need not always be shunned. Where the fluid is only very mildly corrosive to either metal, dissimilar metal couples will cause no trouble. This is demonstrated by the large number of brass-trimmed cast iron and steel valves in use in oil-field service. Dissimilar metal combinations are used to advantage in galvanized steel. The zinc here corrodes and thus protects the steel base material.

Rusting and Inhomogeneities

Rusting is an electrolytic corrosion of the oxygen concentration cell type. It starts by drops of moisture collecting on the surface and starting these tiny cells. Sulfur dioxide, carbon dioxide, and salt—which are present in the air near the seacoast—all aid in the corrosion. Once some corrosion product is formed, these iron salts, being hygroscopic, can take up enough water to form an electrolyte even though liquid water is not added to the surface. On a moist day tiny droplets of liquid can be observed on a rusty steel surface. Steel does not rust in dry air nor in neutral brine solutions devoid of oxygen. Polished steel surfaces are regularly kept from rusting in routine laboratory work by storing the sample in a dry dust-free container.

Steels used in tubing, casing, and some sucker rods are far from homogeneous materials. Steel is composed of alternating grains of relatively pure iron (ferrite) and grains of mixtures of iron carbide and iron (pearlite). These grains are ordinarily less than 0.01 in. in diameter. Luckily these two types of grains are not often of such difference in corrodability that some unattacked grains are left to drop out because all the material around them is gone. The points of different composition may, however, be the start of the various types of corrosion cells mentioned.

Besides the variation due to pearlite and ferrite grains, steel also contains nonmetallic inclusions called "dirt." These again are of small size and can undoubtedly start the corrosion cells. But even though no inhomogeneities are present in a metal, external variations will usually initiate the cells whenever a corrosive agent is present.

Examples of very clean steels are the low-carbon high-nickel sucker-rod steels. Since they are exposed to the same corrosive agent as the tubing, which is of a relatively dirty steel, a good comparison can be obtained. Generally, the difference in corrosion rate is not pronounced. This demonstrates that the inhomogeneities ordinarily encountered are not a large factor in the corrosion of equipment used in the wells.

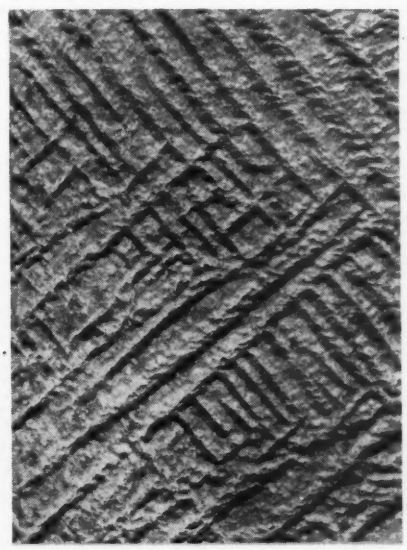
Scale and Paint

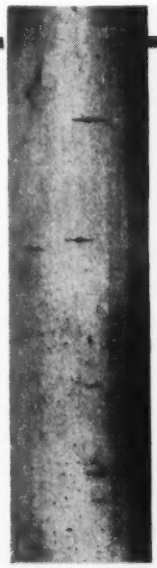
Scale on tubing, sucker rods, and casing presents a problem much like that of dissimilar metals. Oxide scale is a fair conductor of electricity, while at the same time being a relatively noble material. Completely continuous scale would afford a fair degree of protection; but the ordinary discontinuous scale under some circumstances can decrease life markedly. If a piece of clean steel is adjusted to conditions so that oxygen concentration cells start, these may be spaced at very close intervals; and the corrosion for all practical purposes become general. If, however, a piece of steel has the oxide coating broken and there is a solution sufficiently conductive for currents to bridge the small discontinuities involved, the corrosion will be localized to a few areas instead of over a larger area. This may increase the rate at which pits penetrate the surface, although the total corrosion rate on a weight-loss basis over a given area may be decreased. Because of the speed with which strong acids attack steel, scale could be quite destructive.

The corrosion mentioned above is dependent on having a continuous film of water present. A well producing very little or no water would not have such a film, and descaled tubing would not be expected to have any value. Wells causing rapid corrosion, or high-temperature wells which are to be acidized, would be the ones in which descaled tubing might be worth while.

Under certain circumstances paint can act much like scale. Paint does differ somewhat from scale in that it is usually a poor conductor, and this reduces the magnitude of the current and the corrosion below that experienced with an oxide coating. Paint-free metals would likewise be desirable under the same conditions as those which favor the use of scale-free materials. Where pitting is severe, galvanized equipment should be

5—Bimetallic corrosion occasioned by mill scale on tubing, corroded with inhibited acid. 6—Corrosion along strain lines. This corrosion is of the dissimilar metal type. 7—Fatigue cracks in a sucker rod





investigated, because the sacrificial action of zinc minimizes pitting.

Ringworm Corrosion, Embrittlement, and Blistering

Ringworm corrosion is a localized bimetallic corrosion occurring near the upset on sucker rod and tubing. Its appearance is that of a band of metal having been gouged away. The metal of this band is in a highly strained state and has a higher energy level than the rest of the section. Consequently it is less corrosion resistant than the rest of the tubing or sucker rod. Since it is surrounded by more noble materials, a simple bimetallic cell is set up which attacks this easily corroded band while protecting the adjacent material from corrosion. Even by itself the material of this band would corrode faster than the normal steel. This type of corrosion can be virtually eliminated by the use of "fully normalized" sucker rods and tubing.

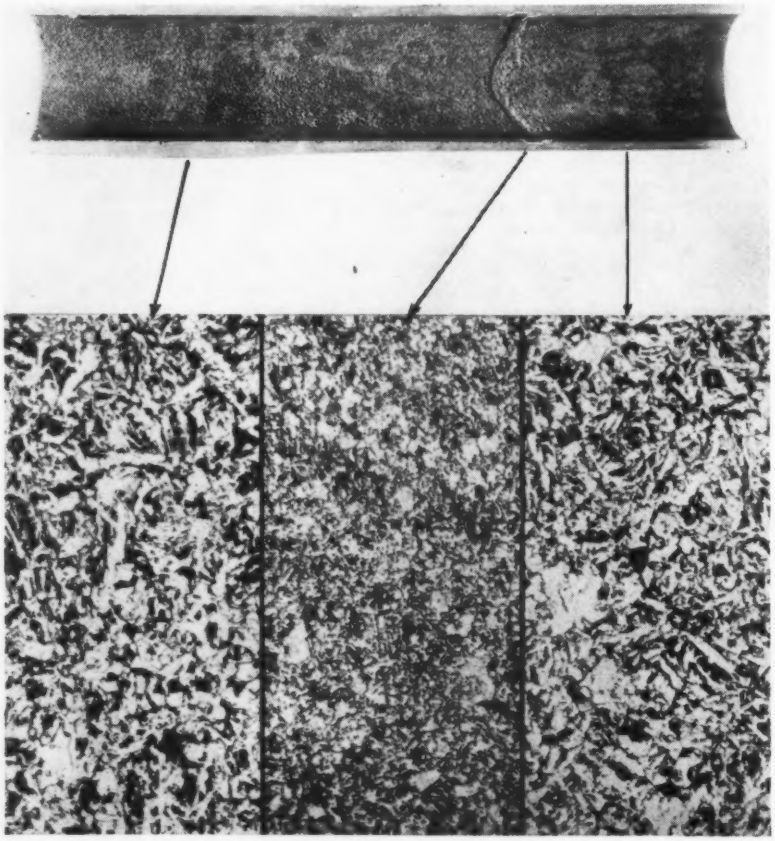
One of the corrosion products of steel attacked by hydrogen sulfide is atomic hydrogen. In the atomic form it is readily soluble in iron, in which it causes embrittlement. Workers in fields producing sour crude may have occasion to see sucker rods which are brittle as they are pulled. Later they recover their ductility. The embrittlement is caused by the dissolved hydrogen, while the recovery of ductility indicates that the hydrogen has escaped. In some steels, such as stock-tank steels, the atomic hydrogen forms the insoluble molecular hydrogen at discontinuities and voids in the steel. So long as corrosion continues, the pressure continually enlarges these points until they are finally visible as blisters.

Well Currents and Corrosion Fatigue

Well currents are an indication that corrosion is occurring. The currents are usually set up by corrosion cells, but they are also capable of causing further corrosion. Where the current leaves the steel (positive pole) stray current cells will be set up. If these cells are localized, rapid pitting may result. Calculations show that 1 amp. year removes 20 lb. of iron at 100 per cent current efficiency, and 10 lb. at the usual current efficiency of 50 per cent. It is easy to see that the damage resulting from a 2 or 3-amp. well current can be very severe if it results in pitting.

Since the rod string has frequent contact with the tubing at rod guides, couplings, and other points, the current carried by the sucker rods will short out at these points rather than set up stray current cells. Tubing and casing, particularly the latter, suffer most. Insulated lead lines will prevent the surface current from going into a well. There is no guarantee, however, that currents are not traveling from one subsurface strata to the other. Until data are gathered to indicate the magnitude of such subsurface currents, it is well to use insulated lead lines where well currents are of large magnitude.

Fatigue is failure under repeated stresses. The effect of corrosion, which may be very mild as determined by loss in metal thickness, is to accelerate markedly the rate of failure. Corrosion fatigue is of concern on sucker rods and drill pipe in subsurface equipment, but it may also be found on pumps, engine parts, etc. Storing sucker rods outdoors may cause tiny pits on the surface. These pits can decrease the fatigue life of the rods greatly when exposed to rather high loading. Mechanical features to watch are deep scratches, hammer marks, and deformation, such as are obtained by bending the sucker rod or drill pipe.



"Ringworm" corrosion in oil well tubing. The photomicrographs (500X magnification) show the structures in N-80 tubing which are associated with this type of corrosion

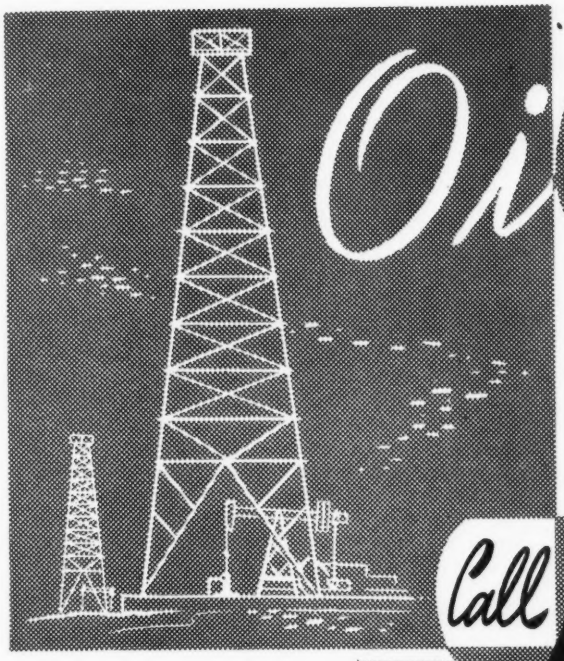
Corrosion Control

Experiencing corrosion, what can be done about it? Some possibilities have been pointed out previously. Basically, three methods of control are available: (1) Changing the nature of the corrosive agent, (2) keeping the corrosive agent away from the material being corroded, and (3) using materials that are less easily corroded. Examples of these methods of control are the adding of inhibitors to acid, the painting of steel, and the use of fully normalized tubing (where ringworm corrosion occurs). The possibilities of the fundamental control methods need further comment.

Regulating the Corrosive Agent

Having corrosive conditions, sometimes matters are made worse by letting corrosive agents get mixed. For instance, when air is allowed in contact with hydrogen-sulfide bearing liquids in stock tanks, several new agents are added. The air is bad enough, but it also combines with some of the hydrogen sulfide to form sulfuric and sulfurous acids. Instead of having to resist hydrogen sulfide only, the metal now has to resist four agents.

Keeping air out will minimize the corrosion on ordinary steel. Wherever oil wells are suffering from oxygen corrosion, it is certain that the operator is at fault, not nature. The air can get into wells by having a vacuum on the producing strata and thus allowing air to get into them whenever a well is shut down for overhauling. Another way to get air into the producing strata is to allow air to get into the water or gas recycling system. Keeping the gathering lines under vacuum will always allow this



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to happen to some extent. Measures to minimize or prevent air in-leakage are indeed worth while.

In some wells producing large quantities of gas with the oil and water it might be feasible to use a bottomhole choke to reduce the temperature by expansion of the gas. The lower pressure would also decrease the solubility of the acid-producing carbon dioxide and hydrogen sulfide gas. Some condensate wells are produced at so low a flow rate that they load up with water—so that the well can be said to percolate. Producing at a higher flow rate should decrease the amount of aqueous acid in contact with the tubing and thus minimize corrosion.

While the use of inhibitors for oil wells does not seem very promising, it should not be forgotten. It is conceivable that conditions favoring their use or better inhibitors themselves may be found in the future. Sodium sulfite injections could be used to eliminate small amounts of oxygen in wells experiencing pitting by a combination of elevated temperatures and oxygen.

A high oil-to-water ratio (attainable to some extent by well workovers and lowered production rate) aids in several ways. The flowing temperature of the well is usually reduced. This lowers the reaction rate. A more important effect is that it reduces the amount of continuous water phase and thus increases the electrical resistance. This increased resistance reflects itself in a lower corrosion rate by electrolytic type of corrosion. Corrosion occurring by direct chemical attack, such as by hydrogen sulfide in the oil phase, would still continue. However, it is not believed that this is a major factor.

Isolating the Corrosive Agent

Use of protective coatings seems promising for equipment not subjected to mechanical abrasion. Among the possibilities are tubing lined with hard, baked, organic resin and tank lining of rubber-like plastics. There is also a possibility of lining tanks and separators with sheets of thin plastic.

More Corrosion-Resistant Materials

In practical corrosion work, metals with perfect corrosion resistance are not often used. Instead, the less resistant materials are used because of their lower cost. With this cost limitation the metals for oil field work are comparatively few. Some generalization can be made. Weak acids can be handled in various copper and copper-nickel alloys. Strong acids have to be considered individually. Oxidizing conditions, in absence of chlorides, frequently require stainless steels—which form a very adherent and protective oxide film on their surface. Aluminum bronze and tin bronze are used with aerated acid waters and brine.

Even within the range of ordinary steel there is some choice of material for oil-well tubing. In some scale-forming services pearlitic medium-carbon steels are apparently more corrosion resistant than either lower carbon steels or steels in which the carbides are highly spheroidized. The grain size and form and distribution of carbides are large variables. Until further work allows close specification of these factors, broad recommendations cannot be made. Similarly, in nonscale-forming services low-carbon steels are sometimes more resistant. Where this is true, strengthening agents like phosphorus and nickel could be used.

Some of the alloy materials also deserve consideration for use in oil-well tubing. For acid wells, such as distillate wells, copper alloys and monel metal deserve study. They could be used in the section of the well showing accelerated corrosion. Wherever the copper alloys are coupled with steel, precautions must be taken to minimize bimetallic corrosion. High nickel steels may also be useful. Trials are being made to prove their value.

The copper-base alloys, the monel and the nickel steel mentioned in the preceding paragraph could be used for sucker rods. But besides these, there are several materials especially adapted for use in rods. Zinc plating and possibly dip galvanizing, of steel rods might have value in lengthening life where minor pitting causes rapid fatigue failure. Nickel plating of sucker rods should be advantageous for wells very high in both hydrogen sulfide and carbon dioxide.

Nonmetallic materials have application for lead lines and other low to moderate pressure surface pipe. Asbestos-cement pipe and asphalt-impregnated fiber pipe have been extensively used in some fields. Cement-lined steel pipe is used occasionally. The ordinary portland cement, however, cannot be used if the bicarbonate or acid concentration is high.

There is considerable choice in materials to minimize atmospheric corrosion. Galvanizing has long been used for protection against rusting. However, much of the present-day corrugated sheet has too thin a coat of zinc to be practical for long time use. It is generally accepted that the so-called "low alloy" steels (copper-nickel steel, chromium-nickel steel, etc.) are considerably more resistant to atmospheric rusting than plain carbon steels. These alloy steels would be particularly applicable to derricks and tanks. Sheet aluminum and aluminum-coated steel merit consideration as substitutes for galvanized sheet.

In the realm of theory are drastic changes in steel alloys to change the action in weak acids and to strengthen their film forming characteristics. Results in this field are apt to come more slowly. Developments in this direction, however, dare not be overlooked.

The Matter of Records

Performance of equipment can be studied thoroughly only if adequate records are available. These records should be such that it is possible to determine the exact nature and frequency of the failures. Rather than a change of material such data may, for example, indicate the need for heavier wall tubing or upset end tubing. Without accurate field records it is not possible to determine the value of new materials. Knowledge of past performance will aid in diagnosing the problems and may even indicate the superior characteristics of some material already in use.

Alert operators are constantly noting such things as the peculiar pitting of some materials, the localized nature of corrosion on pumps, screens, and valves, and the changes in the corrosiveness with time. Such additional information is very valuable in studying and controlling corrosion and should be carefully recorded.

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2. "Corrosion Resistance," Section D of Nickel and Nickel Alloys, Development and Research Division of The International Nickel Co., 1941.
3. Galvanic Corrosion and Dissimilar Metals in Salt-Water Solutions, H. R. Copson, paper presented at mid-year meeting of the A.P.I., May 30, 1940.

BOOKS

SCIENTIFIC INSTRUMENTS. Edited by Herbert J. Cooper. Published by Chemical Publishing Co., Inc., 26 Court Street, Brooklyn. 304 pp. $6.

This book discusses a wide range of instruments designed for making physical measurements. Not only laboratory instruments but also those used in the field, in industry, and commerce are well covered. Much space is devoted to the principles on which the various instruments are based, and to methods of measurement. It is replete with diagrams and photographs.

THE INDUSTRIAL REPUBLIC. By P. W. Litchfield. Goodyear Tire & Rubber Co., Akron. 224 pp. $4.

This volume presents the views the author, chairman of the Goodyear board, has gained through a half century of industrial service. Its arrangement is somewhat unusual in that the first of its four sections is a reprint of a book on the same subject he wrote in 1919. The second section reviews the record of the Goodyear Industrial Assembly, the third the impact of modern unionism on the Goodyear company, and the fourth discusses wages, profits, taxes, government controls, and the methods of communistic and fascistic dictatorships and offers the outline of a plan for American production—industrial democracy.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Fuel Oil Tests

Can you tell us of the importance of ash content and b.s. and w. in fuel oils, or direct us to some references? —F.R.P.

Frequent questions about fuel oil indicate that the general properties of fuel oils as well as the particular tests of the question should be presented. There are so many designs of burners, and fuel oils are generally such cheap materials that not much definite information on the performance of fuel oils is available.

Flash point is fundamentally important with respect to the danger of explosions or fires. Inasmuch as many fuels must be heated to obtain suitable burner operation, a conservative requirement would be a flash point that is above the temperature to which the oil will be heated for firing. Such flash points would be somewhat as follows:

Furol vis. @ 122° F.	Conservative flash point, °F.
40	165
50	175
100	200
300	235

These are 30° to 80° F. higher than common specifications. However, the flash point must not be too high for quick ignition for those fuels that depend upon partial vaporization for ignition and particularly if an off-and-on automatic firing system that is ignited by a pilot flame is employed. This is indicated by the maximum flash-point specifications of 165-230 of A.S.T.M. distillate Fuels 1, 2, and 3.

Pour point is obviously important because wax tends to plug lines and filters. This is particularly significant if the burners are fed by gravity from the storage tank.

Ash and b.s. and w. and to some extent carbon residue are an indication of the presence of rust, sand, corrosion debris, chemical neutralizers, or carbonaceous material that may clog strainers, lines, and burner tips. Nothing is more troublesome to plant operators than to labor over a burner that repeatedly blows out or tends to smoke because the tip becomes plugged. Per cent ash without a chemical analysis of the ash tells little about the presence of such materials as lime or caustic soda. These chemicals are widely used in combating sulfide corrosion in cracking plants and they appear almost totally in the cracked fuel oil. Such chemicals tend to flux with the fireclay walls of furnaces and boiler settings, in some instances producing a pool of molten flux on the floor of the still. Question has also been raised about the possibility of such ash components being hydrolized in presence of moisture to produce corrosive materials.

Carbon residue determined on the whole fuel oil is not of much significance but when determined on the A.S.T.M.-10 per cent residue of the distillate fuel oils it is related approximately to the amount of burner carbon. Glendenning and Sullivan (see references at end) mention only 10-day operation of a vaporizing-type burner when operated on a fuel that showed 0.012 per cent carbon residue (on 10 per cent bottoms). For pressure atomizing burners the carbon residue may be much higher as:

	Carbon residue
A.S.T.M. Fuel 5	3
A.S.T.M. Fuel 6	8

They also report tests on a vertical rotary burner in which the carbon deposited (50 gal. burned) dropped from 50 to 3 grams when the carbon residue (on 10 per cent bottoms) was lowered from 0.3 to 0.05.

Distillation points are not much related to performance although the 10 per cent point is a rough indication of the ease of ignition and thus becomes somewhat significant for the volatile or medium distillate fuels. The 90 per cent point is somewhat related to coke formation but is probably not as significant as the carbon residue test.

Sulfur is not considered important except that a high-sulfur fuel can cause rapid corrosion of steel stacks that are operated at low temperatures. Moisture condensed from the stack gases absorbs sulfur dioxide to produce sulfurous acid. Coals usually contain more sulfur than fuel oils.

Gravity is not directly of much significance but it does indicate something of the general properties of the oil. A low gravity may indicate a high-boiling or very viscous oil, but if the oil was produced by cracking it will naturally have a lower gravity than other oils. If the oil must be displaced from storage by water, its gravity must be over 10 A.P.I. This is an important specification of British admiralty heavy fuel oil. Finally an oil whose A.P.I. gravity is about 10 will not permit rapid separation of suspended water.

Thermal value is obviously a direct measure of the ability of an oil to generate heat. Nevertheless, the use of a high thermal value oil which cannot be burned as effectively as an oil of lower heating value defeats this advantage. On a gallon or volume basis the low-A.P.I. fuels have the highest heating values but on a weight or pound basis the high gravity fuels are superior. Thermal value is related to gravity somewhat as:

	B.t.u./lb.	B.t.u./gal.
Fuel 1, 39 A.P.I.	19,700	136,000
Fuel 2, 35 A.P.I.	19,550	138,000
Fuel 3, 30 A.P.I.	19,300	141,000
Fuel 5, 18 A.P.I.	18,500	146,000
Fuel 6, 10 A.P.I.	18,300	153,000

A change of gravity of 1° A.P.I. causes a change in heating value of 500 to 900 B.t.u. per gallon (60-110 B.t.u. per lb.).

Viscosity is important because proper atomization does not occur unless the viscosity is somewhat low. Thus, thick oils must be heated and the cost of the heat is not negligible. According to the survey entitled "Oil-Firing Temperature" on the Questions on Technology page of —(fill in)— 1946, the viscosities at the firing temperature should be:

Atomizer—	Univ. Saybolt
Mechanical	66-170
Steam—outside mix.	130-340
Steam—inside mix.	340-680

Glendenning and Sullivan report tests which show that each atomizing burner requires a particular viscosity fuel in order to operate most effectively. Thus, for a 3-gal. pressure atomizing nozzle with an inside disk, the capacity varies with viscosity as follows:

Univ. @ 100° F. Saybolt	gal./hr. Capacity,
35	3
50	3.67
70	4.2
90	4.06
120	3.7

The spray angle from the nozzle of some pressure atomizer burners decreases 2 or 3 degrees for each increase of one in the viscosity (Univ. Saybolt at 100° F.). Unfortunately, there are numerous burner designs.

Stability of color or particularly with regard to tendency toward sludge formation is important. Many residual cracked fuel oils deposit large amounts of b.s. and w. when mixed with low-boiling distillates particularly straightrun distillates. The amount of b.s. and w. produced is far in excess of the amounts present in the two fuels before mixing. The straightrun residual fuels are usually not troublesome in this respect.

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SUCCESS STORY ....

THE other day, to satisfy our innate curiosity, we sat down and counted up the number of plants in which ALCO prefabricated pipe had been installed. The total was 316—*a success story in which some of the most prominent corporations and companies in the United States had a part.*

No one knows better. than a plant manager, or a plant engineer, how widely varying are prefabricated pipe requirements. Though nearly every installation presented an entirely new problem, ALCO designed and built pipe which completely satisfied *every one* of these 316 good customers.

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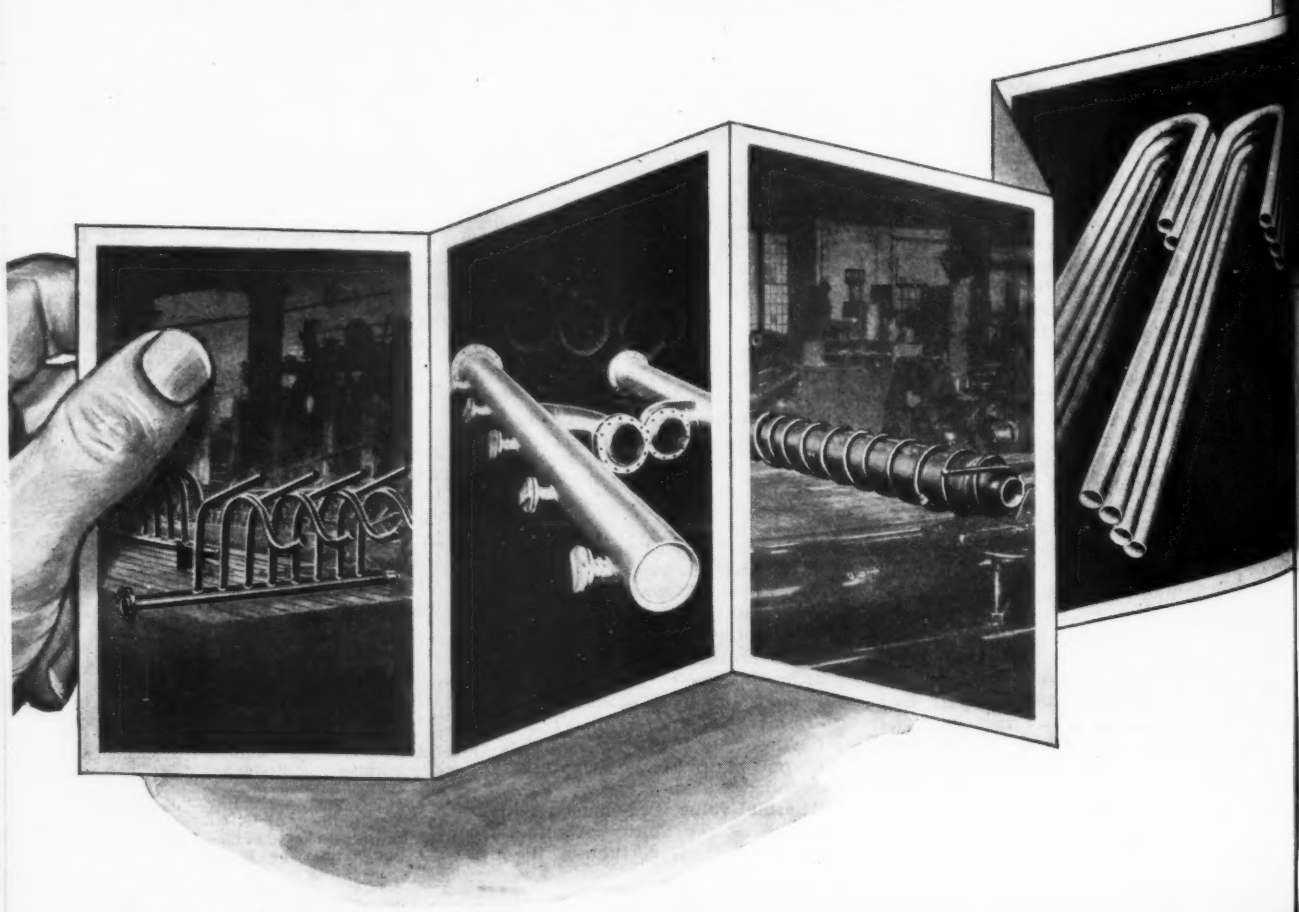
ALCO's competent, progressive engineering staff is at your beck and call. Let us assist you in your pipe problems. Perhaps *your* case history will be the *317th chapter* in a success story which has no ending. Address inquiries to the American Locomotive Company, Alco Products Division, 30 Church St., New York 8, New York.



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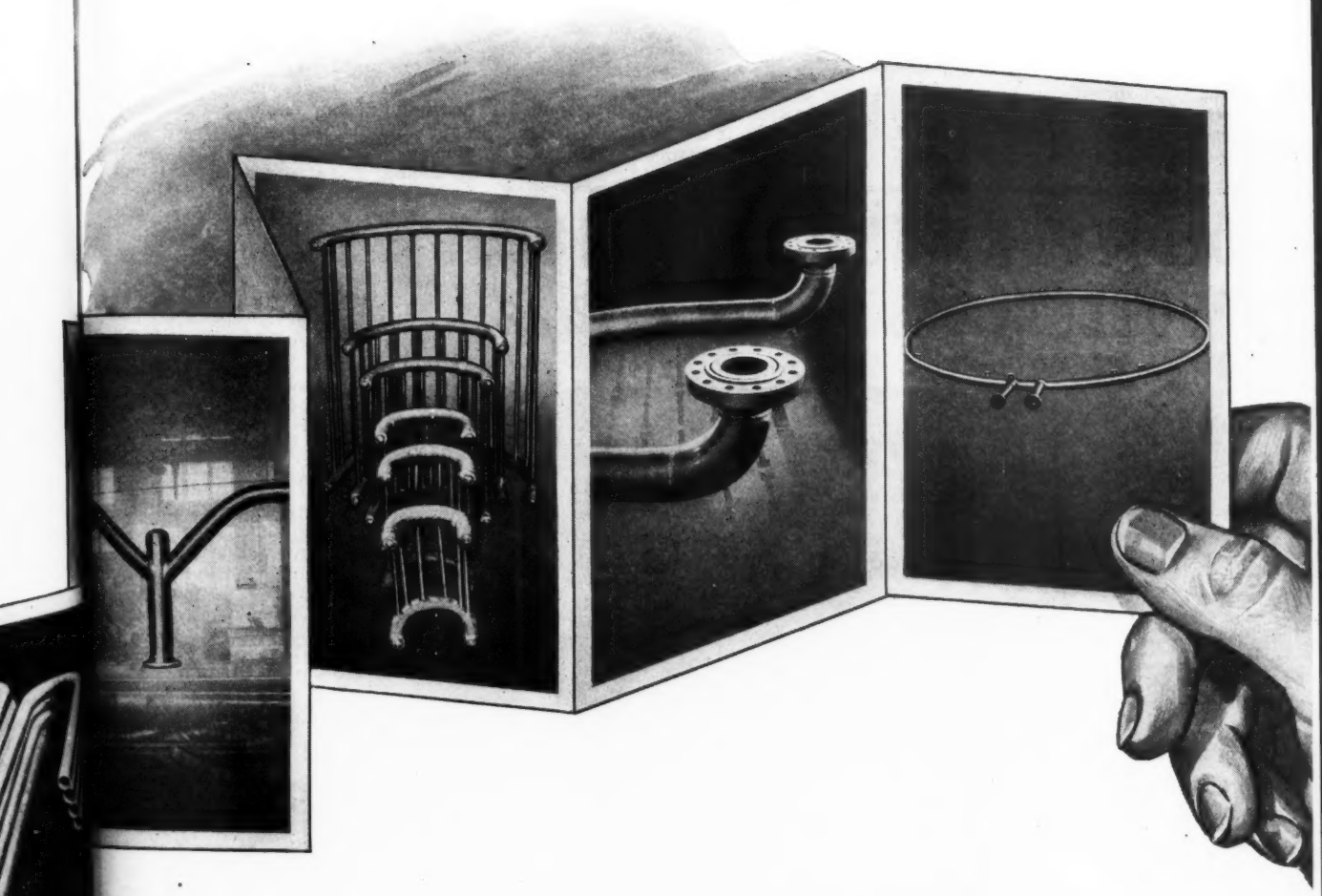

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Deep Development in Illinois Basin

(Continued from page 86)

sidering the uncertainties of production, pending the time when more information as to the productive potentialities of these formations can be obtained by more thorough development in the shallower fields outside the basin. A further complication has been that the drilling rigs commonly used in the development of the shallower horizons throughout the area have been of a light, portable or semi-portable type, inadequate for the deeper drilling. For the deeper drilling, larger and heavier equipment, which has not been readily available because of use in better proved development, would have to be moved in.

The latest attempt to explore the possibilities of Ordovician production in the deeper part of the Illinois Basin area has been in a deep test just drilled by Continental Oil Co. in the Griffin field, located in the Wabash River bottoms, Gibson County, Indiana. This test, drilled on a Papoose Oil Co. lease, is designated as 1-D Cooper. Its official location is 305 ft. north and 405 ft. east of the southwest corner of Section 13-3s-14w. It was started as a test to the Trenton lime, which was topped at 6,165 ft. and drilled to a total depth of 6,408 ft. At that depth it is the second deepest hole, in footage, which has been drilled in the Illinois-Indiana and Kentucky area.

Failing to find any production in the Trenton, it has been plugged back to 3,265 ft., where, as this is written, preparations are being made to test showings that were passed up in the St. Louis formation at 3,142-48 ft. Present deepest production in the Griffin field is the McClosky lime, found at depths of from 2,850 to 2,880 ft. Prior to the Trenton test, three wells had been deepened to the St. Louis and Salem, the deepest going to 3,539 ft. In addition to the McClosky lime, nine shallower formations are producing. The deep test topped the Devonian at 4,631 ft. and the Maquoketa shale (first Ordovician) at 5,869 ft.

The drilling record of this test is indicative of some of the difficult conditions that can be expected in deeper exploration throughout the area. Hole was started March 14, 1946, and total depth was reached August 6, the over-all time being 146 days. Bits totaled 112, of which seventeen 12¼-in. bits were used to 3,002 ft., and ninety-five 8¾-in. bits from 3,002 ft. to total depth of 6,408 ft. The 12¼-in. bits averaged 176 ft. and 20½ hours run per bit. The 8¾-in. bits averaged less than 36 ft. and only 18,85 hours run per bit. Chert sections were encountered in which frequently bits averaged less than a foot per hour, and as little as 4 ft. per bit was made.

Hole and Casing Program

Standard practice in development of the regular producing sands in the field has been to set from 220 to 240 ft. of 10¾-in. surface casing in 12½-in. drilled hole reamed to 16½-in. The setting point is below the lowest surface gravel bed. Below this, 8¾-in. hole has been drilled to the top of the lowest producing sand, and 7 or 5½-in. casing set and cemented for the oil string. In the deep test, 12¼-in. hole was drilled to 223 ft., and reamed to 17½ in. for 13⅜-in. casing, which was set and cemented at 198 ft., using 250 sacks of cement circulated to the top. Below this, 12¼-in. hole was drilled through the regular producing sections to 3,002 ft., where a protection string of 36 lb. 9⅝-in. casing was set and cemented with 500 sacks of cement, top of the cement behind the pipe being above the highest producing sand. Remainder of the hole was drilled with 8¾-in. bits.

Over-all time to 3,002 ft., including cementing of the protective casing string (run April 12) was approximately 30 days. Of this, net drilling time was 348.5 hours. The 223-ft. surface hole was drilled and reamed, and casing run and cemented between the day tour of the first day and the

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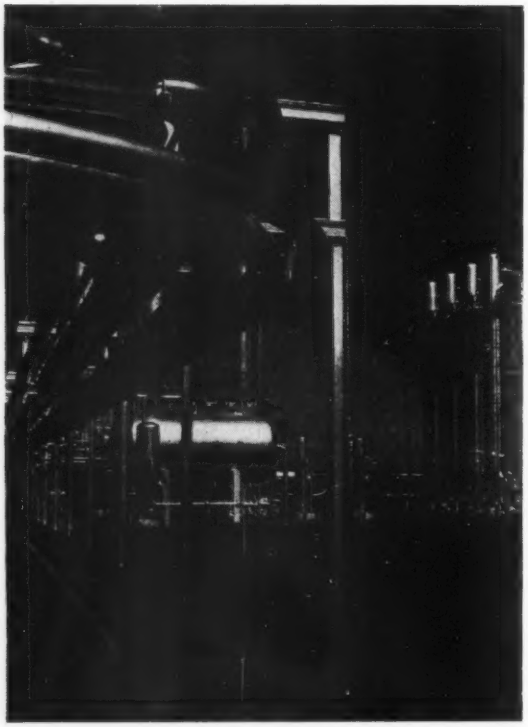

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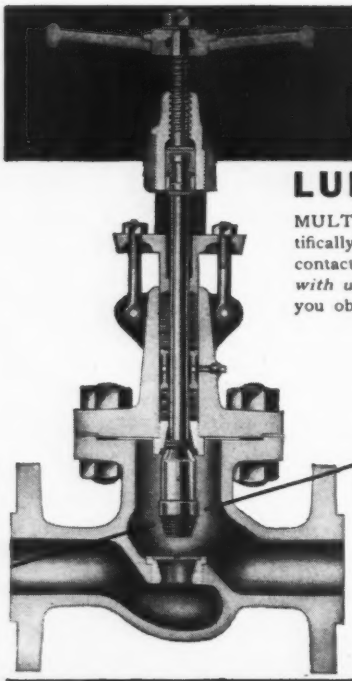

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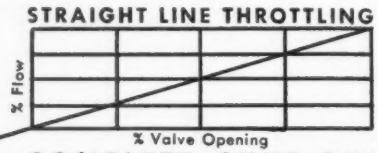

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evening tour of the second. Cement was allowed to set 36 hours and hole started under the surface on the day tour of the third day. Six days were lost by a shutdown at 2,075 ft. when flood waters from the Wabash River overflowed the field March 23-30.

Drilling of surface hole for all wells in the field has required the use of heavy, high-viscosity mud. Surface formation contains quite a bit of gravel and sand which wash out badly unless such mud is used. Usually about 65 sacks of gel mud are mixed and lime added to get necessary viscosity and weight. This is jetted after the surface casing is run, and hole below the surface is started with water, and drilled to a point above the first producing horizon with native mud.

The deep test was drilled to 2,075 ft. with native mud. At that depth, because of the impending shutdown due to the Wabash River overflow, approximately 85 sacks of gel mud were mixed and conditioned with 50 lb. each of quebracho and caustic. Upon resumption of drilling after the 6-day shut down, mud control became an important phase of the operation. Prior to entering the Tar Springs sands below 2,120 ft., in which there is a strong water flow, the mud was treated with Baroco to prevent contamination. Later, while drilling the Cypress sand at 2,933 ft., the hole started losing mud. The loss became complete with the mud showing up in a well, located 105 ft. distant, which had been producing from that sand. In that well it was found that the mud had filled the tubing and casing. Fibretex and other formation-sealing materials were added to the system and after 5 hours circulation was restored.

Mud Specifications

Close control of both mud weight and water loss was demanded while drilling below the protective casing string. Before entering the Salem formation, 325 sacks of Baroid were added to build up the weight as a precaution against possible gas pressure. Weight was maintained around 9.7 lb. per gallon to 4,127 ft., where the hole started losing circulation. To prevent mud loss, it was necessary to reduce weight to a maximum of 9.1 lb. At the same time, weight had to be held above 8.9 lb. to prevent shale caving. Water loss had to be held under 15 to 18 cc. to stop water filtration, and above 11 cc. to obtain adequate mud cake. From 5 to 20 sacks of Baroid were added daily throughout the drilling to control the weight. Formation sealing materials were added frequently. Best results were obtained with a mud viscosity of from 38 to 40 seconds.

Down to 5,600 ft. the following mud materials and additives had been used: Aquagel, 3,500 sacks; Baroid, 1,370

sacks; Baroco, 90 sacks; Fibretex and similar materials, 3,895 lb.; Palco seal, 4,360 lb.; caustic and quebracho, 450 lb. each.

A gas detector was operated continuously on the mud returns. No indications of the presence of gas in commercial volumes were given, although showings were encountered at several levels. A core in the Dutch Creek formation at 4,872-73½ ft. showed slight oil saturation. Drill-stem tests were made at 3,783-3,805 ft. and 4,858-73½ ft. Both showed a slight odor of gas but no oil. A complete electric log was run from total depth.

The well was drilled by E. F. Moran, using a rig that had been employed in development of the field's shallow horizons. The rig in this case, however, is larger and heavier than those commonly used in Illinois and Indiana operations. It is one of a very few in the entire district which does not have a mast-type derrick. The derrick is a standard 122-ft., 24-ft. base, steel structure with an 8-ft. substructure. Equipment included a 7½-in. Union Tool (National) draw works and 7¼ by 18-in. pump, powered by two Waukesha gas engines, each capable of developing 185 hp. As a precaution against possible gas pressures in the lower horizons, the well had both a master gate and a blowout preventer on the 13⅜-in. casing, a hookup not normally used in the district. Since no cellar was used, the rotary was elevated 4 ft. above the derrick floor to accommodate the height of the control hookup. In conformity with standard Continental practice in the field, the rig was supported on a solid concrete foundation, 32 ft. square and 32 in. thick, which serves as the base for the pumping installation upon completion of the well.

Oil Company Given Holmes Awards

Stanolind Oil & Gas Co. has been awarded six certificates of honor by the Joseph A. Holmes Safety Association for outstanding safety records established during recent years including the war period. Such awards are considered the highest recognition in the mineral and allied industries for accomplishments in accident prevention.

Stanolind's award covered company-wide operations for having operated a period of 7 years with an exposure of 59,127,696 man hours worked with an accident frequency rate of 6.66. Other awards granted were:

The Wewoka area of the Central Division, Oklahoma; the Hastings area, producing operations of the Texas-Louisiana Gulf Coast division; the entire North Texas-New Mexico

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division; the East Texas area of the North Texas-New Mexico division, and the Yates area of the North Texas-New Mexico division.

Gas-Pulsation Problems

(Continued from page 79)

help to get meter readings that are readable, whereas there are cases that without some type of dampening device it would be impossible to even read the meter charts.

Volume bottles are quite often installed on both the discharge and suction side of compressors. Their volume often varies over quite a range, depending on the pressure and compression ratio involved. In many instances their cubical contents vary from 5 to 15 times the compressor displacement. Their purpose is to minimize the effects of reflections previously mentioned and thereby permit the compressor cylinders to work under the most advantageous conditions, and consequently keep horsepower losses at a minimum. In addition to volume bottles the lateral piping is often oversized to add additional volume to the system. Most of these volume bottle installations improve the ill effects of pulsation but in general do not reduce them to a minimum because of the large volumes required to do this. The volume and consequent size required for a satisfactory pulsation reduction in the higher-pressure services is extremely uneconomical and is often impractical to locate. Upon occasions resonate conditions have been produced by bottle and lateral sizes where pulsative conditions were more pronounced than would have existed had no partial corrective measure been applied.

The pulsation dampener, designed on a filter principle, has been universally used to correct pulsation problems and consequently their secondary effects by converting the pulsative flow into a steady flow. The design is sufficiently flexible to allow for either a manifold type for multicylinder service, or an in-line type for single cylinder service. Being a filter device it offers only a high resistance to a pulsative flow and permits a steady gas stream to pass through it with very low pressure drop. In most cases, it is practical to design dampeners for a pressure drop of about ½ per cent of the operative pressure that are capable of removing in excess of 95 per cent of the pulsation peaks. With the elimination of this high per cent of pulsations then it naturally follows that vibration in piping and equipment caused by pulsative flow is eliminated. This means that elaborate hold-down systems, mechanical dampeners, etc., may be eliminated. It also follows that any errors in metering due to pulsations are automatically eliminated by the removal of the pulsations.

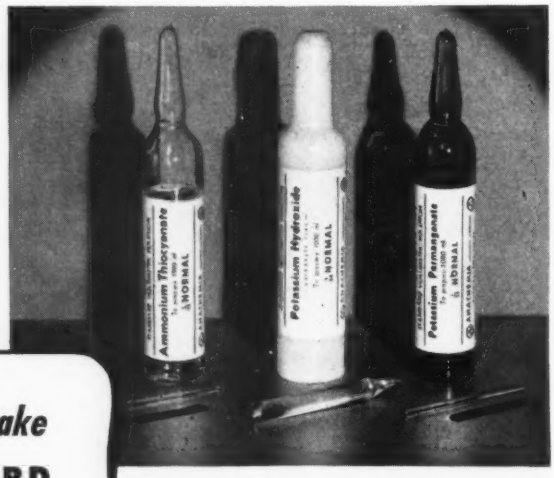
Improvements in compressor cylinder conditions by the installation of pulsation dampeners may be divided into two classes which are, installation on discharge and installation on suction side.

Discharge Side

Installation of dampeners on the discharge side of compressors results in the removal of pulsations on the high-pressure laterals, headers, and equipment. The compressor cylinders are naturally working under a more advantageous condition in this instance because there can be no reflections, resonate conditions, or standing waves which can create unusual instantaneous pressure conditions within the cylinder during the interval that the discharge valve is open.

On the suction side of compressors the installation of dampeners results in a uniform pressure condition at the time the suction valve is open. This prevents the previously mentioned condition of starvation one instant and a supercharged condition the next instant, and results in a uniform suction pressure condition for the compressor.

One other factor in plant design is worthy of mention and that is the



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Necks of all glass ampoules are prescratched so that an ampoule can be easily split into two parts by merely heating the glass rod supplied with it, and applying the heated rod to the scratch. Wax ampoules (containing alkali solutions carbonate free) are opened by simply passing the heated rod through the head.

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fact that all piping and equipment may be sized for steady flow if dampeners are to be installed, thereby eliminating the effect of oversizing for pulse peak velocities.

The Permian Basin Fights Corrosion

(Continued from page 77)

done with insulated flanges or plastic or plastic impregnated fiber nipples. The cost is so low that operators feel that should such devices prevent electrolytic corrosion in less than 10 per cent of the wells so equipped, the protection is well worth the outlay.

New Tanks in Use

Lease tanks are high on the corrosion casualty list, in some extremely bad locations, lasting less than a month before repairs are required. Some operators resort to the use of redwood tanks, and many are lining steel tanks with the new plastic coatings, some of which are standing up well after 2 years' service. Proof of long-term protection must await further use of plastics in the field.

Another approach to the tank corrosion problem is the use of aluminized steel. A wartime development employed by the Navy in oil-storage tanks in the Pacific theater, the material shows good promise of holding up under the type of corrosion encountered in leases producing sour oil and water. At present the new steel is available in strips 3 by 6 ft. for bolted tanks. It consists of a finished tank steel which is impregnated with aluminum under extreme pressure and temperature. The metal surfaces are bright, and have remained so in the twenty-four 1,000-bbl. installations made to date in West Texas. The first tank of this type was placed in use in the Fullerton field in May 1944. After 2 years of service under mildly corrosive conditions, the tank was thoroughly inspected and showed no trace of pitting or discoloration. Visual inspections above the oil level since that time indicate no change. The oil contains about 0.7 to 0.8 per cent sulfur, the gas tests 1,000 grains of hydrogen sulfide per 100 cu. ft. and some water is produced with oil. Formerly, tanks under similar conditions were replaced on the average of every 2 years.

At Fullerton, engineers of Fullerton Oil Co. have combined the use of aluminized steel in a conical bottom tank design developed in conjunction with Maloney-Crawford Tank & Manufacturing Co., to produce a lease tank with very interesting corrosion-resistant features. As presently in-

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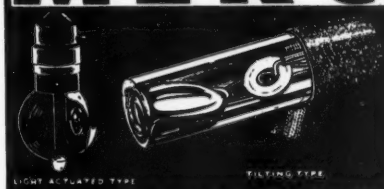

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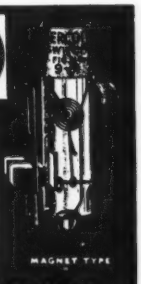

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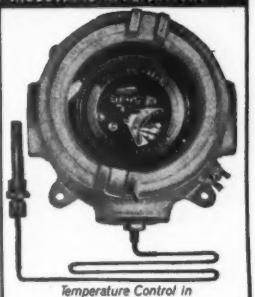

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stalled, the tanks are fabricated directly on the ground, on a soil base to conform to the conical bottom. The 1,000-bbl. tank bottom is given a pitch of about 1 in. per ft. of radius. At the bottom center is a ¼-in. galvanized welded steel sump measuring 30 in. in diameter and depth. A bleeder or drain pipe, as illustrated in the sectional drawing, removes water and basic sediment which has gravitated to the sump, without removing pipeline oil. The sump can be drained with less than a 1-ft. head of oil, and in some cases will siphon completely dry.

The particular advantage in this design lies in the continuous removal of water from the tank bottom. Since it is not possible to drain the last 3 in. of fluid from the ordinary tank, the bottom and lower 3 or 4 in. of sidewall are subject to severe corrosion, in some cases requiring replacement in as short a period as 1 month. Corrosion has been particularly troublesome in the vicinity of the lower end of the downpipe, where turbulence exists.

A conical bottom with sump further facilitates cleaning, although constant drainage of water and other foreign matter requires far fewer actual cleaning jobs.

On locations where caliche or salt or moist soil are present, operators plan to place such tanks on steel substructures or concrete beds, which will elevate the tank about 2 ft. from ground level at the outer circumference and allow direct drainage from the bottom of the sump in a ground level line. It is proposed, further, to insulate the tank and connecting lines to reduce danger of electrolytic corrosion.

The smaller sheets of aluminized steel increase fabrication costs which, plus the price differential between the new metal and common tank steel, combine to increase the price of a 1,000-bbl. tank about $300 to $350. However, since aluminized tanks require no paint, the added cost is offset over a period of time. Complete corrosion protection for 2 years is already proven, and the new product, like the plastic linings, must show further oil-field service before its long-term prevention of corrosion is established.

New Product Applications

A variety of theories are being investigated at present, and new ideas for use of plastic coatings are being planned for early practical test. Plastic paint is now being tried as a lining for tubing and surface field lines. These applications have not yet been inspected and more time is required to indicate their worth. Improved application to such uses is planned, and a projected method for coating pipe and tubing interiors may prove practical in eliminating the imperfect coating at joints. The possibility of using short plastic nipples in tubing strings is being discussed, as a measure to reduce electrolytic corrosion, but no definite solution is known yet. Corrosion of exposed surfaces of all well head connections exists in some cases, particularly where cellars were filled. To combat this one operator plans to make a test case of one such well. The cellar will be left open, and the christmas tree and all surface connections will be cleaned, sand blasted, and sprayed with plastic coating.

Corrosion inhibitors, such as formaldehyde, the sodium chromates and caustics are being widely tested and conclusive results based on their histories may be shortly available.

The most encouraging indications that corrosion may eventually be eliminated, however, arise from the scientific approach being taken to the problem in general. In both the Battelle studies and the work projected by the New Mexico School of Mines, objective investigation of causes should form a better basis on which to determine preventive measures, prove or disprove many theories now held, and eliminate haphazard control methods.

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The Oil-Well Pump

As with the simple water pump described in the previous article, the oil-well reciprocating pump, which is the kind most commonly used in oil-field operations, depends for its action upon the creation of a pressure differential.

In its simplest form, Fig. 1 (a), it consists of (1) an outer, hollow, steel cylinder known as the working barrel, **B**, with its inner surface ground to a smooth finish; (2) a close-fitting hollow plunger, **P**, which slides up and down within the working barrel; (3) a traveling valve, $\mathbf{V}_t$, fastened inside the plunger and moving along it; (4) a standing valve, $\mathbf{V}_s$, placed near the bottom of the barrel, and held in place by means of special packing material.

The working barrel **B** is threaded on the outside at top and bottom, and is attached to the tubing by means of the usual tubing collar, **L**, before the tubing is placed in the well. The plunger **P**, with its traveling valve $\mathbf{V}_t$ is screwed onto the sucker rods, which extend from the working barrel to the surface, where they are connected by means of the polished rod to the mechanical unit that is used to operate the pump. The standing valve $\mathbf{V}_s$ may be placed in the working barrel before it is placed in the well or it can be installed along with the plunger by the use of special attachments screwed to the top of the standing valve and the bottom of the plunger; these act as a single unit during installation.

When the pump assembly has been lowered into the tubing and working barrel, its weight will force the standing valve unit into place in the special ring inside the bottom collar, or shoe. Release of the standing valve is usually accomplished by giving the rods a partial turn to free the connecting mechanisms and then elevating the rods a sufficient distance to make sure that the special devices will not bump each other during the pumping of the well. It is not good practice to drop the standing valve into the working barrel since this is very likely to cause damage.

The operation of the pump is also similar to that of the water-well pump. At the beginning of the downward plunger stroke, the fluid in the space between standing valve and plunger, space **C**, will be slightly compressed, and thus a pressure created which is greater on the underside of valve $\mathbf{V}_t$ than on top of it; as a result $\mathbf{V}_t$ opens, and the movable part or ball, **A**, moves upward away from its seat and permits fluid to pass upward into the tubing from chamber **C**. Throughout the entire downward stroke of the plunger the valve $\mathbf{V}_t$ remains open and hence the full length of the fluid column in the tubing rests on the bottom or standing valve $\mathbf{V}_s$.

As soon as the plunger starts upward, or reverses its direction of

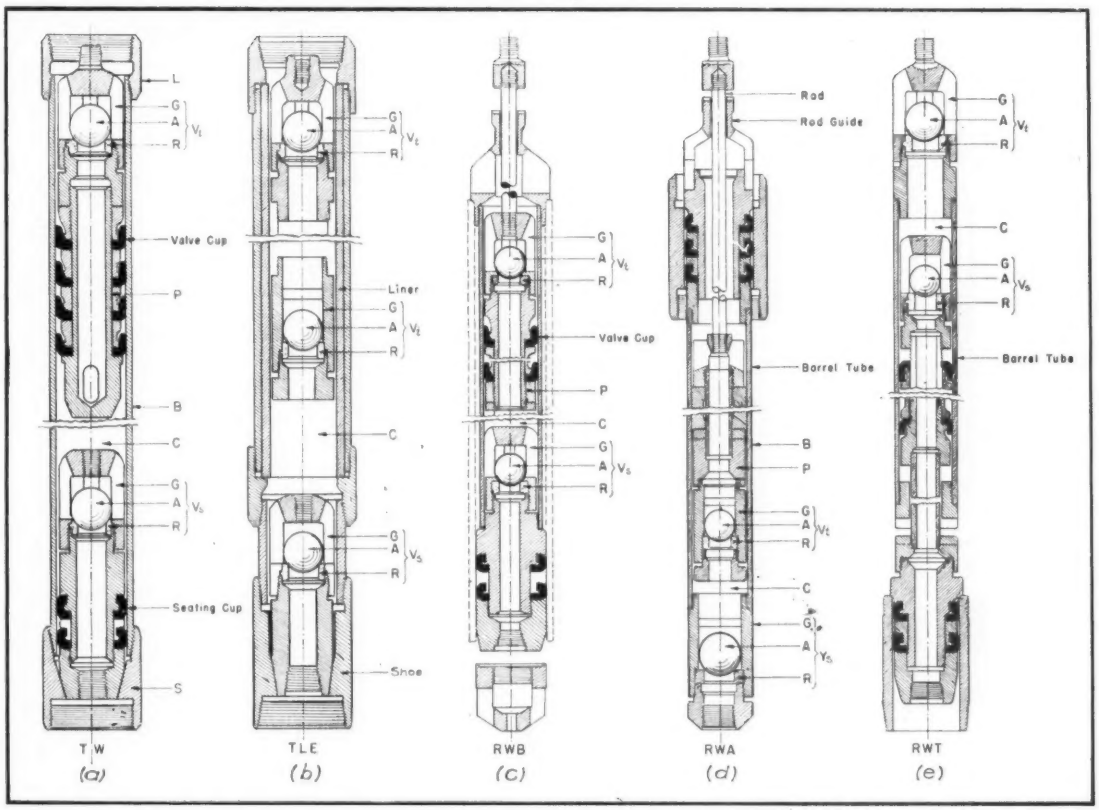

Fig. 1—(a) Tubing type with shoe; (b) Tubing type with extension shoe and nipple; (c) Rod type, stationary barrel, with top hold-down; (d) Rod type, stationary barrel, with bottom hold-down; (e) Rod-type traveling barrel

Series prepared by Dr. E. A. Stephenson, head of petroleum engineering school, University of Kansas

travel at the end of the downstroke, the weight of the fluid in the tubing closes the traveling valve V_t quickly and tightly, and the pressure or weight of the fluid in the tubing is then transferred from the standing valve V_s to the valve V_t. Continued upward movement of the plunger reduces the pressure in space **C** between the traveling and standing valves. If fluid is then standing in the annular space between the tubing and casing or between the tubing and the walls of the well—i.e., if the working barrel is submerged in the well fluid—to some height, **h**, the pressure outside of the working barrel at the same elevation as the standing valve V_s will exceed the pressure within the working barrel (a pressure differential) thus lifting the ball **A** from its seat, so that fluid may pass into the working barrel, chamber **C.**

Passage of such fluid through V_s will continue as long as the plunger movement is upward, but when the plunger again reverses its direction of travel, at the end of the upstroke, the pump cycle will start over again. Continued repetition of this process, of alternate downward and upward movement of the plunger, finally fills the tubing and brings oil to the surface where it may be discharged to pipe line or tank.

It is important to keep in mind that during each downstroke the intensity of the downward pressure —pounds per square inch—and the weight of the well fluid rests entirely on the plunger and the traveling valve, thus stretching the sucker rods, while during the upstroke the same pressure and weight of fluid press on the standing valve so that the tubing is proportionately stretched. This continued shift in load from traveling valve to standing valve and back again, alternately stretching first one and then the other, introduces definite complexities into any theoretical analysis of the behavior of the entire system of pumping equipment. A partial study of this problem will appear later.

The most common type of valve for oil wells consists of (1) a hardened steel ball, **A**, which seats against a special hardened metal ring, **R**; (2) a cage constructed with triangular prongs, which restrain or limit the motion of the ball. These are shown in cross section in Fig. 1 (a-e). The lower part of the standing valve may be tapered and for about one-third of its total length be packed with leather, composition, or babbitt metal, or it may be made of carefully machined steel, tapered but with no packing. The lower end is also generally threaded on the inside. The traveling and standing valves may be precisely alike, with reversible seat rings, and hence completely interchangeable, a feature which simplifies repairs and reduces the number of parts that must be carried in stock in the central warehouse.

Five of the common types of oil-well pumps are shown in Fig. 1 (a to e). These are designated as follows:

Type of pump—	Abbreviations: Full barrel	Abbreviations: Liner barrel	Fig.
1. Tubing type with shoe	TW	TL	1 (a)
2. Tubing type with extension shoe and nipple	TWE	TLE	1 (b)
3. Rod type, stationary barrel, with top hold-down	RWA	RLA	1 (c)
4. Rod type, stationary barrel, with bottom hold-down	RWB	RLB	1 (d)
5. Rod-type traveling barrel	RWT	RLT	1 (e)

In the above the capital letters have the following significance:

First letter:
- T = Tubing type; noninserted, run on tubing.
- R = Rod or inserted type; run on rods, through tubing.

Second letter:
- W = Full barrel, supersedes "cold-drawn working barrel," also "cast-iron" type.
- L = Liner barrel; includes sectional and full liners.

Third letter:
- E = Tubing pump with extension nipple and shoe.
- A = Stationary barrel rod pump with top hold-down.
- B = Stationary barrel rod pump with bottom hold-down.
- T = Traveling barrel rod pump.

The following is quoted from the A.P.I. Code of Recommended Field Practice on Care and Use of Oil-Well Pumps:

"Oil well pumps are either tubing (T) or rod (R) types. Tubing pumps are run on the well tubing; that is, the pump barrel is attached to the lower end of the tubing string, and the plungers assembly is run on the sucker-rod string. Rod pumps, formerly called "insert," are run as complete units on the rods only. The maximum bore of these pumps is less than that of corresponding size tubing pumps.

"Barrel units comprise either liner-barrel or full-barrel types. Liner barrels are made up of jackets with sectional or one-piece liners held in position by collars. Full barrels are one-piece tubes threaded at each end.

"Metal plungers are either one-piece construction or built up of metal sleeves clamped on a suitable mandrel (composite type). Plungers with nonmetallic sealing surfaces usually are assemblies of valve cups or packing on suitable mandrels.

"Tubing pumps may be equipped with regular shoes on the lower end, or with extension shoe and nipple. The latter arrangement permits a longer plunger stroke for a given length of pump barrel. Also the plunger may operate through the entire length of the barrel. This allows "follow-up" plungers to be run without removing the pump barrel from the well. In the nonextension type, however, there is less space around the standing valve for the accumulation of sand deposits.

"Rod pumps are of either stationary barrel type with top or bottom hold-down, or traveling barrel type. Stationary barrel pumps have reciprocating plungers actuated by valve rods. In traveling-barrel pumps the barrel reciprocates over the plunger assembly."

The selection of the type of pump should take into consideration the character of the fluid to be lifted; i.e., (a) whether the oil is clean or mixed with water, (b) whether the fluid carries with it sand or other abrasive mineral. Where the fluid is clean oil, metal-to-metal pumps may be used and give longer operation with less time lost for servicing. Some of the corrosion resistant alloys are also wear resistant and hence pumps of this type may give exceptionally long service. If the wells produce considerable volumes of corrosive water then ring or cup-type valves should be used. If the wells produce abrasive minerals the traveling-barrel type appears to provide more satisfactory results. Accumulation of barite, gypsum, and lime in the pump barrel and on moving parts is frequently more troublesome than paraffin decomposition.

The insert pump has the advantage that it can be pulled and essential repairs made without pulling the tubing, thus saving both time and expense. Rod guides are recommended, and several of these should be installed immediately above the pump, where they will preserve the correct alignment of the pump. This is particularly true where insert pumps are used.

References

A.P.I. Specifications for Oil Well Pumps. A.P.I. Std. No. 11-A, Oct. 1944, 71 pp.

Ross, A. S. Theory and Practice in Equipping and Operating a Pumping Well. Drilling and Production Practice, 1944, pp. 34-39.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

0°-50° A.P.I. Versus Specific Gravity

Degrees A.P.I.	Tenths of degrees									
	0	1	2	3	4	5	6	7	8	9
0	1.0760	1.0752	1.0744	1.0736	1.0728	1.0720	1.0712	1.0703	1.0695	1.0687
1	1.0679	1.0671	1.9663	1.0655	1.0647	1.0639	1.0631	1.0623	1.0615	1.0607
2	1.0599	1.0591	1.0583	1.0575	1.0568	1.0560	1.0552	1.0544	1.0536	1.0528
3	1.0520	1.0513	1.0505	1.0497	1.0489	1.0481	1.0474	1.0466	1.0458	1.0451
4	1.0443	1.0435	1.0427	1.0420	1.0412	1.0404	1.0397	1.0389	1.0382	1.0374
5	1.0366	1.0359	1.0351	1.0344	1.0336	1.0328	1.0321	1.0313	1.0306	1.0298
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8	1.0143	1.0136	1.0129	1.0122	1.0114	1.0107	1.0100	1.0093	1.0086	1.0078
9	1.0071	1.0064	1.0057	1.0050	1.0043	1.0035	1.0028	1.0021	1.0014	1.0007
10	1.0000	.9993	.9986	.9979	.9972	.9965	.9958	.9951	.9944	.9937
11	.9930	.9923	.9916	.9909	.9902	.9895	.9888	.9881	.9874	.9868
12	.9861	.9854	.9847	.9840	.9833	.9826	.9820	.9813	.9806	.9799
13	.9792	.9786	.9779	.9772	.9765	.9759	.9752	.9745	.9738	.9732
14	.9725	.9718	.9712	.9705	.9698	.9692	.9685	.9679	.9672	.9665
15	.9659	.9652	.9646	.9639	.9632	.9626	.9619	.9613	.9606	9600
16	.9593	.9587	.9580	.9574	.9567	.9561	.9554	.9548	.9541	.9535
17	.9529	.9522	.9516	.9509	.9503	.9497	.9490	.9484	.9478	.9471
18	.9465	.9459	.9452	.9446	.9440	.9433	.9427	.9421	.9415	.9408
19	.9402	.9396	.9390	.9383	.9377	.9371	.9365	.9358	.9352	.9346
20	.9340	.9334	.9328	.9321	.9315	.9309	.9303	.9297	.9291	.9285
21	.9279	.9273	.9267	.9260	.9254	.9248	.9242	.9236	.9230	.9224
22	.9218	.9212	.9206	.9200	.9194	.9188	.9182	.9176	.9170	.9165
23	.9159	.9153	.9147	.9141	.9135	.9129	.9123	.9117	.9111	.9106
24	.9100	.9094	.9088	.9082	.9076	.9071	.9065	.9059	.9053	.9047
25	.9042	.9036	.9030	.9024	.9018	.9013	.9007	.9001	.8996	.8990
26	.8984	.8978	.8973	.8967	.8961	.8956	.8950	.8944	.8939	.8933
27	.8927	.8922	.8916	.8911	.8905	.8899	.8894	.8888	.8883	.8877
28	.8871	.8866	.8860	.8855	.8849	.8844	.8838	.8833	.8827	.8822
29	.8816	.8811	.8805	.8800	.8794	.8789	.8783	.8778	.8772	.8767
30	.8762	.8756	.8751	.8745	.8740	.8735	.8729	.8724	.8718	.8713
31	.8708	.8702	.8697	.8692	.8686	.8681	.8676	.8670	.8665	.8660
32	.8654	.8649	.8644	.8639	.8633	.8628	.8623	.8618	.8612	.8607
33	.8602	.8597	.8591	.8586	.8581	.8576	.8571	.8565	.8560	.8555
34	.8550	.8545	.8540	.8534	.8529	.8524	.8519	.8514	.8509	.8504
35	.8498	.8493	.8488	.8483	.8478	.8473	.8468	.8463	.8458	.8453
36	.8448	.8443	.8438	.8433	.8428	.8423	.8418	.8413	.8408	.8403
37	.8398	.8393	.8388	.8383	.8378	.8373	.8368	.8363	.8358	.8353
38	.8348	.8343	.8338	.8333	.8328	.8324	.8319	.8314	.8309	.8304
39	.8299	.8294	.8289	.8285	.8280	.8275	.8270	.8265	.8260	.8256
40	.8251	.8246	.8241	.8236	.8232	.8227	.8222	.8217	.8212	.8208
41	.8203	.8198	.8193	.8189	.8184	.8179	.8174	.8170	.8165	.8160
42	.8156	.8151	.8146	.8142	.8137	.8132	.8128	.8123	.8118	.8114
43	.8109	.8104	.8100	.8095	.8090	.8086	.8081	.8076	.8072	.8067
44	.8063	.8058	.8054	.8049	.8044	.8040	.8035	.8031	.8026	.8022
45	.8017	.8012	.8008	.8003	.7999	.7994	.7990	.7985	.7981	.7976
46	.7972	.7967	.7963	.7958	.7954	.7949	.7945	.7941	.7936	.7932
47	.7927	.7923	.7918	.7914	.7909	.7905	.7901	.7896	.7892	.7887
48	.7883	.7879	.7874	.7870	.7865	.7861	.7857	.7852	.7848	.7844
49	.7839	.7835	.7831	.7826	.7822	.7818	.7813	.7809	.7805	.7800

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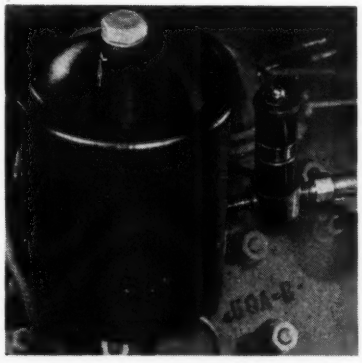

(2) NEW FILTER METER is based on the fact that oil-filter-cartridge life cannot be based on mileage alone. This interesting device indicates visually when a new filter cartridge is needed. The item should be especially interesting to operators of large fleets of trucks or cars. Device is installed so that oil passing through filter also must pass through the meter. *Hunter & Co.*

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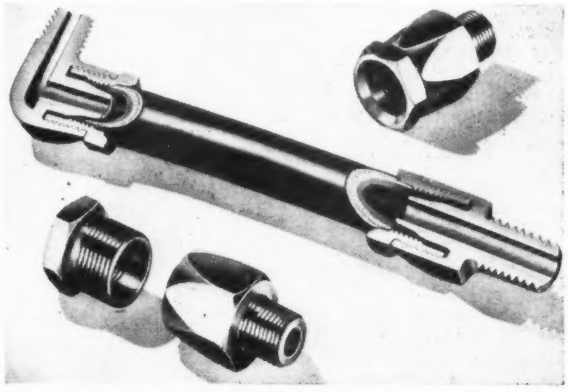
(3) REUSABLE HOSE COUPLINGS now make it possible to hand assemble flexible hose lines. Combined with any flexible hose, these reusable couplings never let go or vibrate loose. Easily attached or detached with end wrench. Coupling nut threads onto the hose, with coupling shell compressing the hose end into a safety-seal gasket. Fitting has a long even grip on the hose,



the double-bell shape of nut allowing hose to flex without cutting. The heavy body of the fitting prevents crushing or distorting of the line. Unusually large square wrench surfaces make assembly operation simple and quick. *Resistoflex Corp.*

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(4) FLUTED-TYPE DRILL-PIPE PROTECTOR designed to give maximum protection to oversized tool joints in small casing without restricting circulation. New protectors are available in two sizes: for 3½ and 4½-in. drill pipe. Descriptive information from the manufacturer states that the fluted design reduces torque, drill-pipe vibration at all rotary speeds, and centers and steadies the tools in the hole during reaming and drilling operations. Relieves friction and reduces wear to a minimum. *Bettis Rubber Co.*

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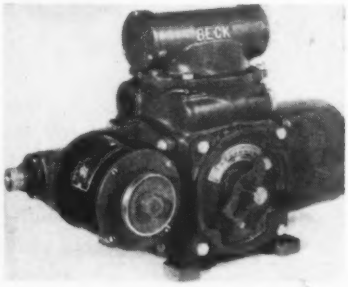
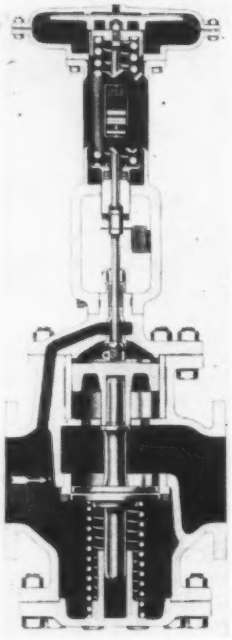
(5) AUTOMATIC CONTROL ACTUATOR operates valves, rheostats, autotransformers and similar devices. Makes close control possible under rapidly changing loads, holds temperature or other conditions to an exact control point free from drooping characteristic, and permits operation at maximum sensitivity. Based on three control actions. C-1 is proportional to and opposes any change of the controlled condition within the throttling range. C-2 and C-3 are the automatic reset or droop corrections which eliminate hunting. Handles special control problems involving sequence action, interlocks, directional contacts, maintaining contacts, and other switching arrangements. Used for control of gas-fired or electric furnaces, automatic reversal of regenerating furnaces, safety circuits for gas purging, and in electrical testing apparatus. *Harold Beck Co.*





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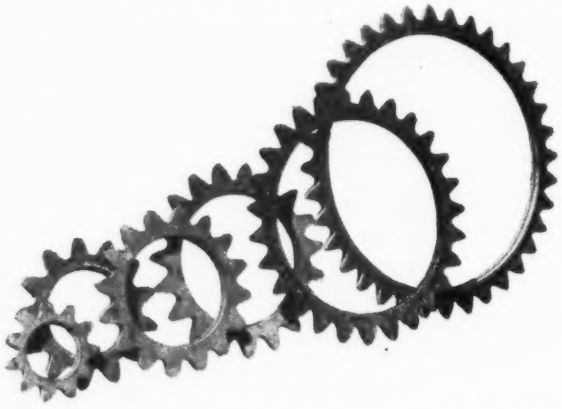
(6) NEW DIAPHRAGM REGULATING VALVE is single seated, fully balanced, and designed to be actuated by standard pressure or temperature instruments or controllers using 20-psi. air or clean water. These valves are made with cast iron, bronze, and steel bodies for steam, air, or gas pressures up to 1,000 psi. *Leslie Co.*

IT'S NEW CHECK IT

(7) NEW-TYPE COMBINATION FIRE FIGHTER with 750-gal. capacity is now being assembled enmasse by one of the largest truck-manufacturing concerns in the nation. With four-wheel-drive action the fire fighter is able to travel faster on any slick surface and can plow its way to fires through almost any severe weather conditions. In rural or oil-field fire fighting it can be driven across the roughest terrain to any water source such as normally inaccessible streams, creeks, or lakes. *The Four Wheel Drive Auto Co.*

IT'S NEW CHECK IT

(8) SPROCKET RIMS made from finest grade, fully heat-treated steel plates. These rims are designed to be easily and quickly welded onto any make sprocket hub. Can be put on in any field shop. Design is ideal for field work where shop facilities are limited. Rims are available for immediate delivery in all popular sizes and types. *Hunt Tool Co.*



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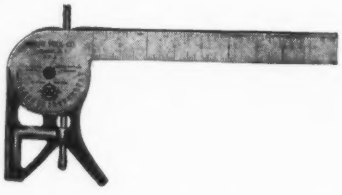
(9) NEW CENTER FINDER PROTRACTOR designed for layout men, welders, foremen, mechanics, and other industrial workers. Serves as a complete 360° protractor. Also has retractable center punch. Has 0°-90°-0° scale together with a double reading of ½-in.-per-foot pitch scale. Complete tool weighs only 10 oz. *Interstate Sales Co.*



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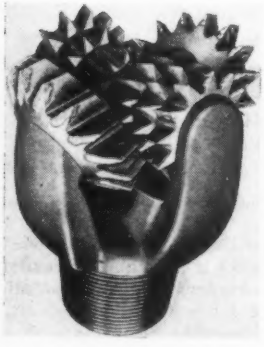
(10) NEWLY DESIGNED ROCK BIT for fast efficient drilling in all sticky shales. The extra-long cutter teeth by which this bit is identified are designed to drill efficiently and economically at high speeds. Additional circulation ports are provided to increase the washing action on all cutters and give assurance that the bit will not "ball up" in any formation. *Globe Oil Tool Co.*



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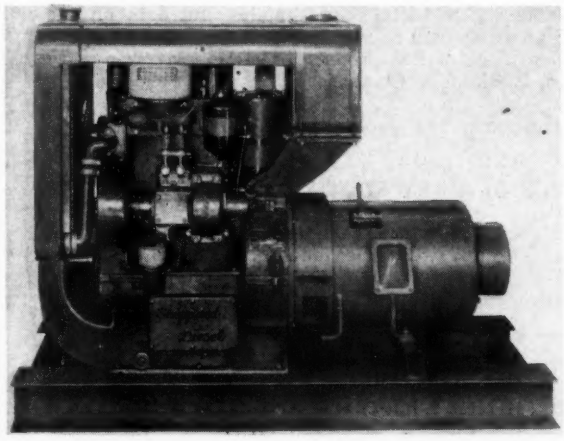
(11) NEW LOCK WRENCH suitable for the tool box of almost any mechanic, is said to have the gripping equivalent to 1 ton pressure. The double lever or toggle action

of this new-type wrench permits it to be used as a combination straight, end or pipe wrench, vise, toggle press, clamp, or pliers. Has a maximum jaw opening of 1¼ in. *A.C.E., Inc.*

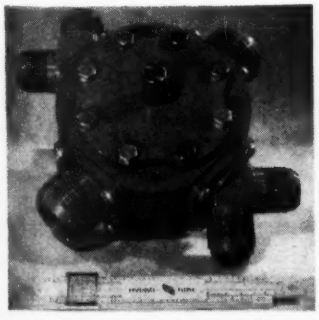
IT'S NEW CHECK IT

(12) REGULECTRIC GENERATORS are now standard equipment on a.c. generating sets manufactured by electrical manufacturer. Main feature is constant, steady power line voltage, without the use of accessory regu-



lating equipment. Extremely sensitive to small changes in generator voltage, it maintains a normal variation of plus 2 per cent from no load to full load. *The R. H. Sheppard Co.*

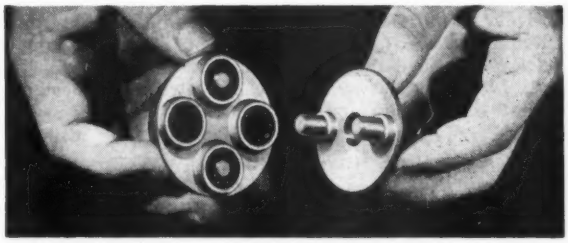
IT'S NEW CHECK IT



(13) NEW FOUR-WAY SELECTOR VALVE is capable of handling flows up to 2,500 gal. per hour with negligible drop in pressure. Sizes range from ⅜ to 1½ in. Features of these valves are: extremely light in weight, low operating torque, can be used for any type liquid, and will withstand operating pressures ranging to 2,000 psi. *Hydro-Aire, Inc.*

IT'S NEW CHECK IT

(14) SMALLER FLEXIBLE COUPLINGS designed for the low power takeoff of fractional-horsepower drives, are recent additions to the line of power-transmission equip-



ment made by a large manufacturer. Couplings are available in two sizes handling 3 and 9 ft.-lb. torque. The items weigh only ½ and 1¼ lb. respectively. *Morse Chain Co.*

IT'S NEW CHECK IT

TRADE LITERATURE

(15) STEAM ENGINES. Catalog available containing interesting detailed information on the Troy-Engberg steam engines, available up to 225 hp. in singles and 450 hp. in duplex models. *Troy Engine and Machine Co.*

IT'S NEW CHECK IT

(16) ANY SIZE AND ANY SERVICE describes fully the written and descriptive content of an interesting and attractive bulletin recently published on couplings. Designed for simplicity of information, this booklet incorporates the use of a thumb index to aid the reader. The thumb tabs are appropriately labeled as follows: "How to order," "Dimensions," "Formula selection," and "Simplified selection." *The Falk Corp.*

IT'S NEW CHECK IT

(17) CORRECT HANDLING OF WIRE ROPE is the name given to an attractive multi-colored booklet published by a large wire rope manufacturer. The booklet is the first of a series to be printed for the users of various makes and sizes of wire ropes. Included in the booklet are illustrations and descriptive paragraphs showing proper methods of coiling, uncoiling, storing, seizing, serving, and zinc seal socketing all wire rope. *Union Wire Rope Corp.*

IT'S NEW CHECK IT

(18) BOILER WATER CONDITIONING is a booklet which describes and illustrates "The Six Fundamentals of Betz Water Conditioning Service," and extends a supervisory service for boiler water conditioning. It also outlines step by step, the procedure to be followed in leading to trouble-free boiler plant operation. *W. H. & L. D. Betz.*

IT'S NEW CHECK IT

(19) PROTECTIVE COATING BULLETIN. This comprehensive eight-page technical bulletin, streamlined for

ready reference, gives complete factual information in condensed form about the entire protective coating line, without embellishment. All industries having corrosion and contamination control problems will appreciate its practical approach to an ever present problem. Chart shows all characteristics and applications of all plastic coatings. *Amercoat Div. American Pipe & Construction Co.*

IT'S NEW ✓ CHECK IT

(20) NEW WINDOW UNITS for indicating and observing liquid level or flow and operation of internal moving parts are described fully in this manufacturer's catalog. Simplicity of installation and the new streamline design are also explained. *Bijur Lubricating Corp.*

IT'S NEW ✓ CHECK IT

(21) AEROSOL WETTING AGENTS for petroleum production. This booklet entails all features of the various wetting agents. Includes chemical and physical properties of Aerosol wetting agents and also all applications and uses. Solubility and surface tension are described fully. *American Cyanamid & Chemical Corp.*

IT'S NEW ✓ CHECK IT

(22) NEW BULLETIN ON TACHOMETERS includes a complete description of the Pyromaster potentiometer-type tachometer together with a description of the millivoltmeter-type indicating, and strip-chart reading tachometers. All applications and illustrations of the instruments are given. *The Bristol Co.*

IT'S NEW ✓ CHECK IT

(23) A SERIES OF EIGHTEEN informative articles has been prepared for the oil industry for distribution to all men in the fields, warehouses, laboratories, and other sections of the industry. It is a full coverage of all the services in the field of Petroleum Reservoir Engineering. Upon request a file folder and the first of the series will be mailed. Additional information will be developed and mailed each month until the series is complete. *Core Laboratories, Inc.*

IT'S NEW ✓ CHECK IT

(24) LONG BALL AND SEAT LIFE now possible through use of new metal called Tantung. Described as a new abrasion and corrosion resistant metal in this brochure, this new material is also nonmagnetic and virtually unbreakable. Tantung balls and seats can be furnished in all sizes. *Jadon Equipment Co.*

IT'S NEW ✓ CHECK IT

(25) MACHINERY AND EQUIPMENT that is made and sold by one of the leading oil field supply companies is illustrated and described in the latest 1946 catalog issued by the company. Much space is given to new and larger pieces of drilling, production, and miscellaneous oil field equipment. *Oil Well Supply Co.*

IT'S NEW ✓ CHECK IT

(26) NEW SNAP TIGHT SUCKER ROD WRENCH is described in a recent booklet by the manufacturer. New design incorporates use of weighted handle to add extra "wallop" to tightening of sucker rod joints. Straight line double action gives maximum rotation plus leverage and snap. Made of heat treated alloy steel. *The S. M. Jones Co.*

IT'S NEW ✓ CHECK IT

(27) HIGH ALLOY CASTINGS. New brochure describes facilities available to manufacture chrome-iron, chrome-nickel, and nickel-chrome static castings, up to 4 tons in weight. Centrifugally cast pipe is also described in sizes up to 16 feet in length and from 2⅜ to 19 inches o.d. *The Duraloy Co.*

IT'S NEW ✓ CHECK IT

(28) FLOW-MASTER EQUIPMENT. Catalog No. 10 now available gives details and engineering data on Flow-Master equipment as applied to continuous or batch processing of petroleum products. The Homogenizer and the Kom-Bi-Nator are both described. *Marco Co., Inc.*

IT'S NEW ✓ CHECK IT

(29) UNIT ALARM SYSTEMS are described in a new bulletin which gives wiring diagrams, dimensions, prices, and complete information on Unilarm, a factory built unit alarm system, sold ready to install. Offers supervision of all types of electrical and mechanical process control in one compact unit. *Russell & Stoll Co., Inc.*

IT'S NEW ✓ CHECK IT

(30) PHENOL PROPERTIES AND HANDLING is a handbook published for the promotion of correct usage of phenol, based on experiences encountered by one of the world's largest manufacturers and users of phenol and constitute. Information contained includes all specifications and physical properties. *The Dow Chemical Co.*

IT'S NEW ✓ CHECK IT

(31) PIPE-LINE SPECIALTIES. New catalog of pipe line specialties contains descriptions of new products for pipe line cleaning, scraping, wire brushes, scrapers, scraper cups, and accessories. Mile post markers for aerial survey are also shown. Catalog is illustrated with photographs of sectional drawings showing construction and operating features. *T. D. Williamson, Inc.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

REFINING

Humble Lets Contract for Solvent Dewaxing Unit

NEW YORK.—Humble Oil & Refining Co. has let contract for the design and construction of a 4,600-bbl. solvent dewaxing unit at Baytown, Tex., to E. B. Badger & Sons Co. of Boston, as a part of its program for expanding facilities for the manufacture of high-quality lubricating oils to meet postwar requirements. The methyl - ethyl - ketone process, licensed by Texaco Development Corp., will be employed. It is anticipated that the plant will be placed in operation during 1947.

Creole Planning Refinery In Western Venezuela

NEW YORK. — The Creole Petroleum Corp., in its midyear report to stockholders, announced plans for a $65,000,000-refinery and housing project for Western Venezuela, which comprises the bulk of its proposed $87,000,000 expansion program.

Amuay Bay, on the peninsula of Paraguana, is being considered for the refinery site, depending upon the acquisition of lands required for the plant and housing necessary for refinery personnel and their families, estimated to total 10,000 persons. The project is expected to get under way this year, with completion scheduled in 1948.

The report on Creole's production in Venezuela in the first half of 1946 showed a total of 95,520,040 bbl. Average daily production, plus purchased royalty oil, was 527,735 bbl., an increase of 29.3 per cent over the corresponding period in 1945. Current production is running about 570,000 bbl. daily, it was said.

New Specification for Burner Fuel Oil

New specifications for a satisfactory fuel oil for vaporizing burners have been promulgated by the technical committee of the oil division, Institute of Cooking and Heating Manufacturers, Dean Olds, chairman of the committee announces. All 42 members of the manufacturers in the industry have approved the specification.

The details of the specification are as follows:

1. Gravity A.P.I. at 60° F. (A.S.T.M. D287-39), 38-42 A.P.I. gravity straight-run distillate.

2. Distillation (A.S.T.M. D86-40), i.b.p. 325-375, e.p. 525-625.

3. Flash point (A.S.T.M. D93-42), minimum, 100° F. or legal; maximum, 175° F.

4. Waxes, gums, and other precipitated materials, metering slots and orifices of standard controls must not become clogged upon prolonged use.

5. Conradson carbon (A. S. T. M. D189-41), maximum 0.05 on 10 per cent residuum.

6. Kinematic viscosity, preferred (minimum 1.7 centistokes. maximum, 2.3 centistokes). These to be changed for 77° F. (25C).

7. Cloud point (A.S.T.M. D97-39), below minimum storage temperature to be encountered.

8. Water and sediment (A.S.T.M. D96-40), maximum, trace.

9. Corrosion, sulfur not in excess of 0.2 per cent unless it does not corrode a copper strip immersed in 212° F. oil for 1 hour.

10. Carbon hydrogen ratio, fuel oil manufactured from paraffin-type crudes or those containing high percentages of paraffin-type compounds are satisfactory. Cracked fuel oils and those containing appreciable percentages of unsaturated hydrocarbons are unsatisfactory.

Sharp Drop Reported in Bright Stock Inventories

Thirteen companies manufacturing lubricating oil in the Mid-Continent area reported a drop in bright stock inventories, from 22 days' supply as of June 30, to 19 days' supply on July 31, according to the monthly summary of Western Petroleum Refiners Association. Bright stock inventories were 144,457 bbl. at the end of July, compared to 169,121 bbl. at the end of the previous month. During the same period viscous neutrals dropped from 235,705 bbl. to 266,750 bbl.

Production of most lubricants was down during July, with the exception of paraffin and blended oils. July production was: Bright stock, 215,698 bbl.; viscous neutrals, 334,414 bbl.; paraffin oils, 75,437 bbl.; steam refined stock, 22,549 bbl.; and blended oils, 355,955 bbl. June production, in that order, were: 227,731 bbl.; 341,-217 bbl.; 66,910 bbl.; 24,190 bbl.; 333,-864 bbl. Domestic and export shipments during July were 3,268 bbl.

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DROP FORGED STEEL
LIQUID LEVEL GAGES

Liquid always shows black—empty space shows white. Preferred where the liquid level must be easily and positively visible, and when liquids are under high pressure or at high temperature. Made of alloy temperature resisting steel and are highest quality throughout. Liquid chamber made from solid block of steel to assure perfect alignment and rigidity. Conform with A.P.I.—A.S.M.E. requirements.

The "Reflex" is one of the complete line of Penberthy Gages that meet every liquid level gage requirement.

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500,000 tons
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15,000 BTU; ash 2-4% (approximately) passing between 0 and 3/5 inch, less than 25% smaller than 1/25 inch.
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ahead of the previous month at 240,362 bbl., but total shipments of viscous neutrals dropped 3.2 per cent, from 313,522 bbl. in June to 303,369 bbl. in July.

University Fellowships Encourage Research Work

TORONTO, Ont. — Four university fellowships and 11 scholarships will be granted annually in the future by Imperial Oil, Ltd., subsidiary of Standard Oil Co. (N. J.), it was announced this week. Purpose of the awards is to encourage postgraduate scientific research.

Fellowships, each of which may be held for 3 years at $1,000 yearly, will be awarded graduates chosen by Canadian universities. Ten 4-year undergraduate scholarships in Canada, and one in Newfoundland, will be awarded children or wards of company employes as selected from applicants approved by the departments of education of the various provincial areas involved. Value of scholarships is $500 a year.

Surplus Styrene Plants Sold

WASHINGTON. — Two surplus styrene plants were sold last week for a combined sales price of $12,815,000, War Assets Administration announced.

The two plants are located at Texas City, Tex., and Kobuta, Pa. The southern plant was disposed of to Monsanto Chemical Co., St. Louis, Mo., for $9,550,000, and will be used in the production of styrene for Rubber Reserve Co. and for commercial sale. Part of the Kobuta property, formerly operated by Koppers United Co., was sold to Koppers Co., Inc., Pittsburgh, for $3,265,000. Only the styrene facilities were concerned in the transaction, but WAA approved a special provision covering use by Koppers of certain common facilities at Kobuta.

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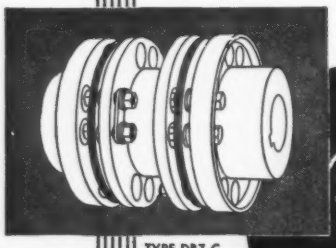

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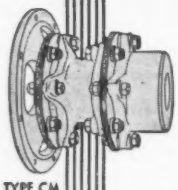
THOMAS Flexible COUPLINGS provide for Angular and Parallel Misalignment as well as Free End Float . . . and Eliminate BACKLASH, FRICTION, WEAR and CROSS-PULL
NO LUBRICATION IS REQUIRED!



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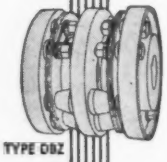

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"Lectures in Science" Start Humble Annual Series

HOUSTON.—The first in an annual series of scientific lectures, recently inaugurated by Humble Oil & Refining Co. and known as "Humble lectures in science," was given by Dr. C. C. Price of the University of Notre Dame, at the Baytown refinery, who spoke on "High Polymer Chemistry."

The series is designed to keep Humble technical personnel abreast of the latest developments. Lectures are offered on two levels of scientific advancement. One group of lectures will be at the very highest level, and the other will correspond to university graduate work.

Dr. F. A. Matsen, University of Texas, opened the graduate series of lectures with a course in physical chemistry.

This group of lectures is designed for technical and research people who have had little or no opportunity for university graduate study. Material presented is of a rather broad general nature, and will be given over a longer period of time. Lecturers at the graduate level have been invited from nearby colleges and universities, such as Rice Institute, University of Texas, and other southwestern schools.

Shell Opens Laboratory At Los Angeles Office

LOS ANGELES.—Establishment of a laboratory at Shell Oil Co., Inc.'s Los Angeles office was announced here recently by S. F. Bowlby, vice president.

The new laboratory, Bowlby said, is a link between Shell's research groups at Emeryville, Calif., and Houston and the production men in the oil fields. The research groups establish the broad lines which seem to offer best results in the recovery of oil and the Los Angeles laboratory adapts these ideas to California operating conditions. The laboratory is located in the Shell Building here.

PIPE LINES

Stanolind Completes First Section of 20-In. Loop

Work has been completed on the section of Stanolind Pipe Line Co.'s 148-mile 20-in. loop. This section, known as Job 1, consisting of 66 miles from Freeman, Mo., to the south bank of the Missouri River, was laid by Oklahoma Contracting Co.

Bechtel Brothers-McCone Co. is reported to have laid approximately two-thirds of Job 2 of this 20-in. project amounting to 82 miles from the north bank of the Missouri River to La Plata, Mo.

All of the contractors' spreads are in the field for the construction of Standard Oil Co. (Indiana) products pipe line from a point west of the company's refinery at Whiting, Ind., to Minneapolis, Minn. Pipe is being delivered to points along the right-of-way and progress is reported as being made in laying the line.

Northern Natural To Expand

WASHINGTON. — Northern Natural Gas Co., Omaha, has asked the Federal Power Commission for authority to make extensive additions to its pipe-line system extending from Texas through Oklahoma, Kansas, Nebraska, Iowa, Minnesota and South Dakota. Cost is estimated at $12,667,600.

The application revealed that the company planned to increase capacity of the line north of Clinton, Kan., from 325,000,000 cu. ft. per day to 407,000,000 cu. ft. per day to meet anticipated demands for gas during the winter of 1947-48.

The facilities for which authorization was requested include compressor units to be added to 14 stations, totaling 17,100 hp. and 8 loops totaling 150 miles varying in length from 6 to 27.10 miles; diameters are 18-in., 20-in., and 24-in.

Other construction includes about 35 miles of 16-in. pipe line from the Sunray, Texas, compressor station to a main line in Hutchinson County, Texas; and an extension of a lateral line from Ames, Iowa, to serve Marshalltown, State Center and Colo; a dehydration plant at Sunray and appurtenant equipment.

The markets the company proposes to serve during the 1947-48 heating season with existing and proposed facilities consist of 198 communities with a total population of 2,000,000 of which 480,000 are residential gas consumers.

Bayou's Loss Is Low in Products Shipments

In delivering products from Texas Gulf Coast refineries to the Plantation Pipe Line Co. terminal at Baton Rouge, Bayou Pipe Line System experienced a loss in the first 7 months of 1946 of 0.22 per cent, which is lower than that reported previously in a review of the present status of Bayou operations published last week.

Saudi Arabia to Permit Proposed Pipe Line

Shaikh Abdulla Sulaiman, finance minister, has announced that the Saudi Arabian Government will give full support to the plans of Trans-Arabian Pipe Line Co. for a pipe line from Saudi Arabia to the Mediterranean. Roy Lebkicher of the government relations department of Arabian-American Oil Co., said that Trans-Arabian has secured rights across Lebanon, Trans Jordan and Palestine and that negotiations are being carried on with Syria. Both Trans-Arabian and American-Arabian are owned by Standard Oil Co. of California and The Texas Co.

Decisions are yet to be reached regarding the location of routes and terminals as well as the time when the line is to be built.

New East Ohio Gas Line To Be Completed in Fall

CLEVELAND, Ohio. — East Ohio Gas Co. is expecting to complete construction and place in operation its 140-mile line from the Ohio River to Cleveland early this fall.

The new transmission line now under construction extends from a connection with Hope Natural Gas Co. at Pipe Creek on the Ohio River through Youngstown, Ohio, to Cleveland. The line from the River to Youngstown consists of about 95 miles of 18-in. welded pipe; the section from Youngstown to Cleveland is 20-in. and about 45 miles in length, according to W. G. Hagan, vice pres-

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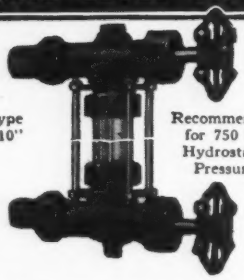

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Steel construction throughout with stainless steel interior trim. Automatic shut-off is positive and instantaneous; stainless steel balls shut off the flow of liquid when glass breaks. Heavy duty stuffing boxes, union connections, offset construction facilitate cleaning and simplify glass replacement. Conform with A.P.I.—A.S.M.E. requirements.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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BULLETIN

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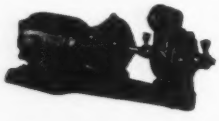
PETROLEUM INDUSTRY

Write for Bulletin No. 102
which shows why and how

BLACKMER ROTARIES
are SELF-ADJUSTING FOR WEAR



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Capacities to 750 GPM—Pressures to 500 psi.

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ident and general manager of East Ohio Gas.

In an application to the Federal Power Commission for permission to construct the line, East Ohio Gas said the project is necessary to alleviate a serious gas shortage and provide a means of meeting future increased demands in the territory served. At the time, the company placed cost of the line at $4,620,000.

Eastern Construction Made Incorporated Company

Eastern Construction Co., Inc., was incorporated as of August 1, with the following officers: C. Hobson Dunn, president; J. W. Hall, vice president, and Miss E. A. Anderson, secretary and treasurer.

The purpose of the new company is to take over the work and activities of Eastern Construction Co., an unincorporated firm. Products line projects recently contracted include a 60-mile section of 8-in. between Wilmar and Alexandria, Minn., for Great Lakes Pipe Line Co. and Sections 6 and 6a of Standard Oil Co. (Ind.), Whiting, Ind.-Morehead, Minn., 8-in. line.

D. C. Cloud, spread superintendent, is in charge of work for the Great Lakes section. Luther Liggett, spread superintendent, is preparing for clearing of right-of-way for the Standard line.

•

New Seamless Pipe Mill Planned at Lorain, Ohio

LORAIN, Ohio.—A new pipe mill capable of turning out long lengths of steel pipe without welds as fast as 2,000 ft. per minute, is scheduled for installation at the Lorain, Ohio, plant of National Tube Co., a United States Steel subsidiary.

Developed by National Tube engineers, the new mill is designed to make small-size seamless products essential to housing and other construction work, including 2-in. boiler tubes. It is the world's first continuous seamless pipe mill, according to a company announcement.

The new process eliminates several steps in the conventional method of making seamless pipe. In standard practice, a solid round steel bar, heated white hot, undergoes five separate operations to be transformed into pipe. The Lorain innovation combines most of these into one step, the company said.

The conventional method starts with the first piercing operation in which an opening is formed lengthwise through the solid bar. Then comes the second piercer, in which the opening is enlarged; the high mill, which produces a uniform wall thickness in the pipe; reeling, to attain perfection in the pipe's surfaces; and finally the sizing rolls, where the product attains its desired diameter and length. In the continuous seamless mill, the innovation comes after the first piercing operation, which remains unchanged. After the first piercing, the shell is processed through a nine-stand continuous rolling mill, which accomplishes the same results as several steps in present practice.

Pipe Line Outlets Will Serve Jenday, Fanska Pool

McPHERSON, Kans.—Construction work on two pipe line projects by Bay Petroleum Corp. was announced recently, which will provide outlets for gas from the Jenday pool and oil from the Fanska pool. Amos Pollard, superintendent of Bay's refinery, estimated that both lines would be completed within 60 days.

A 6-in. oil line will be laid from Bay's pumping station at Roxbury, Kans., to the Fanska pool in northwestern Marion County, a distance of about 6 miles, to give that field its first pipe line outlet.

Corrosion Committee Appoints Secretary

The Interindustry Correlating Committee on Cathodic Protection has appointed F. E. Dolson, St. Louis County Co., St. Louis, Mo., as secretary. At the recent meeting in St. Louis where the American Petroleum Institute was represented by H. H. Anderson, Shell Pipe Line Corp., chairman, L. F. Scherer, Texas Pipe Line Co.

Raymond Hadley, Susquehanna Pipe Line Co., and Guy Corfield, Southern California Gas Co., were there for the American Gas Association; G. R. Olson, United Gas Pipe Line Co.; O. C. Mudd, Shell Pipe Line Corp.; F. J. McElhatton, Panhandle Eastern Pipe Line Co., represented the National Association of Corrosion Engineers.

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217 Railway Exchange Building
Kansas City 6, Missouri

NATURAL GAS

W. Edmond Allowable Cut To Reduce Waste of Gas

The four-county West Edmond pool of Oklahoma last week had its allowable cut back from 77,000 to 40,000 bbl. daily, retroactive to September 1, in an effort to reduce gas waste, the State Corporation Commission announced. Per-well allowables dropped from 124 to 61 bbl. daily.

With more than 700 producing wells in the field, flowing from Hunton lime (wells in the shallower Bartlesville sand were not restricted), the gas-oil ratio has steadily gone upward from an average of 3,000 cu. ft. per barrel some 6 months ago, to an average of 6,219 cu. ft. at the present time, according to Walker T. Pound, chief conservation officer.

In testifying before the commission, Pound said that reduction in allowables would result in greater ultimate recovery of oil, promote conservation, and reduce the amount of gas being vented into the air. Gas being vented, he pointed out, amounted to 319,047,000 of the total of 384,597,000 cu. ft. produced before the cutback.

Dan O. Howard, geologist, who has supervised all of the gas-oil-ratio tests made in the field for the conservation department, joined Pound in recommending a reduction of oil allowable. Results of tests just completed, showed a number of wells with ratios in excess of 8,000 cu. ft. "The old gas-oil ratio of 3,770 cu. ft. of gas per barrel of oil remains unchanged for September," Pound said, "but a new ratio will be established for October."

Little opposition was met by the commission. Lloyd Gray, Gulf Oil Corp. engineer, said that with a steady cutback in daily per-well allowables since discovery, from the top of 300 bbl., plus the nonuniform conditions of the lime zone, made the present gas-oil ratios within reason. Robert M. Williams, attorney for Phillips Petroleum Co., protested the sudden reduction imposed an economic hardship on companies which have contracts and commitments for the purchase and resale of crude.

Pound pointed out that plans have been approved for two new 12-in. gas pipe lines to the field and that expansions have been approved for the two gasoline plants in the field. "These installations will permit greater marketing of gas but will not absorb all of the waste," he added. The only two gas purchasers in the field at this time are Oklahoma Natural Gas Co. and Cities Service Gas Co.

Some 52 operators in the field are affected by the order, including Phillips, Sohio Petroleum Co., Stanolind Oil & Gas Co., Peppers Refining Co., Denver Producing & Refining Co., Carter Oil Co., Anderson-Prichard Oil Co., Cities Service Oil Co., Amerada Petroleum Co., Skelly Oil Co., Fox & Fox, and Ace Gutowsky.

New Facilities Authorized For Gas Transportation

WASHINGTON.—The Federal Power Commission made public an order this week authorizing Virginia Gas Transmission Corp., Charleston, W. Va., to enlarge its transmission facilities to augment Washington Gas Light Co.'s supply of natural gas. Added facilities will enable Virginia Gas to increase deliveries to Atlantic Seaboard Corp., which in turn supplies gas to Washington Gas Light Co. Consumers affected are in the District of Columbia, Maryland and Virginia.

The order also permits Virginia Gas to construct a pipe line to deliver natural gas to the Lynchburg Gas Co. Lynchburg consumers now receive manufactured gas. Present facilities for the manufacture of gas were declared inadequate to meet present demands and the change to natural gas will result in reduced rates to consumers. Total cost of the facilities authorized by the order was estimated at $900,000.

Gas Short Course Has Large Attendance

KINGSVILLE, Tex.—More than 200 industrialists from 10 states attended Texas A. & I. College's first annual short course in gas technology, August 27, 28 and 29, which was sponsored by Southern Gas Association, to study dehydration of foods, natural gas transmission and air conditioning.

Dean A. Strickland, Houston, president of the association, and Frank S. Kelly, Jr., Arkansas-Louisiana Gas Co., Shreveport, presided at the general assemblies.

P. C. Keith, president of Hydrocarbon Research, Inc., warned registrants that to withstand competition from the coal industry in the manufacture of gasoline, they must constantly improve their processes and keep the price of the finished product down. He told how gasoline would be made from carbon monoxide and hydrogen at his company's $15,000,000 Carthage hydrocol plant at Brownsville, Tex.

In other general assembly programs, Dr. W. R. Hainsworth, vice president, Servel, Inc., cited advantages of using natural gas in air conditioning. Capt. E. S. Pettyjohn, U.S.N.R., director, Institute of Gas Technology, described German synthetic gasoline plants. H. M. Shedd, Carrier Corp., explained the operation and benefits of the centrifugal gas compressor.

Field trips were taken to installations in the vicinity, including a cycling plant of the Chicago Corp. and a gas dehydration plant of Tennessee Gas & Transmission Co., both near Kingsville, and the Evergreen Farms' cereal grass dehydration plant at Raymondville, Tex.

Natural Gasoline

Natural Gasoline Advances Will Feature WPRA Meeting

Recent advances in catalytic desulfurization of refinery and natural gasolines will be the feature topic for discussion at the forthcoming Western Petroleum Refiners Association meeting to be held in Wichita, Kans., September 26, according to the manufacturing committee of the association.

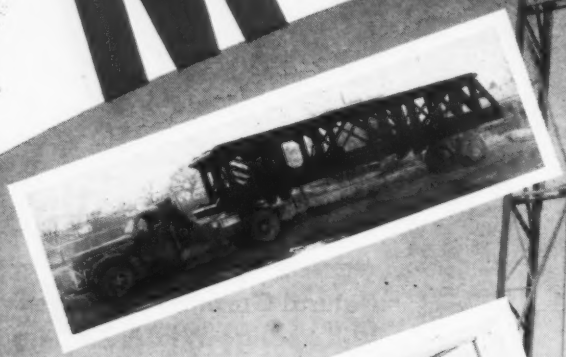
The discussion will be presented by M. W. Conn and George M. Bruno, Phillips Petroleum Co., and much of the data is said to be of wartime origin and hitherto unpublished. A second paper to be heard deals with water treating at the Talco refinery, by C. G. Rook, Jr., Talco Asphalt & Refining Division of Liberty Oil Co.

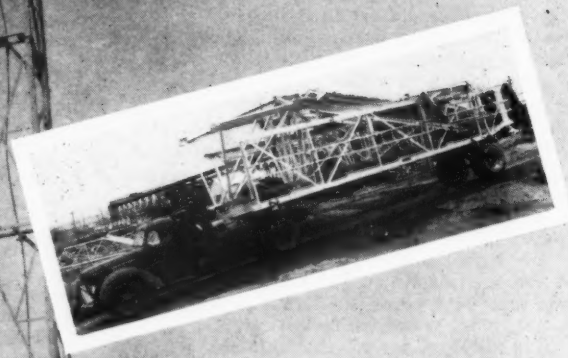
The meeting is expected to be of particular interest to Mid-Continent refiners and especially those who have not installed catalytic cracking facilities for the manufacture of aviation gasolines during the war.

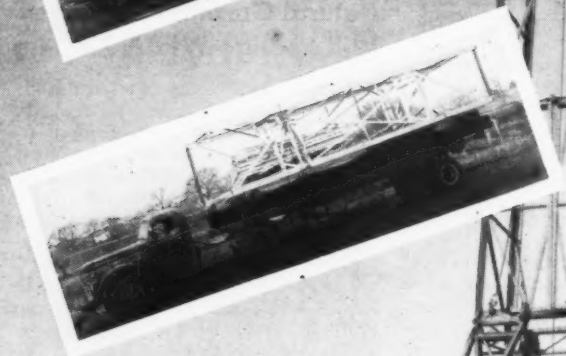
Natural Gasoline Meet To Be Held in Dallas

Plans for the 26th annual convention of the Natural Gasoline Association of America to be held in Dallas, April 23-25, 1947, were announced this week by William F. Lowe, secretary. Originally scheduled for Tulsa immediately preceding the International Petroleum Exposition, NGAA directors decided to return to Dallas in 1947 after postponement of the exposition until 1948.

Moore Masts







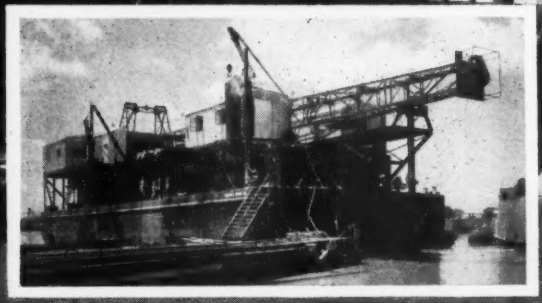
Universally adaptable to drilling situations, the portable Jackknife Cantilever Rotary Drilling Mast performs its functions on land or sea.

This 126′ Moore Mast was used to drill deeper than 8,000′ on a well in Texas. It was set up with Lee C. Moore unitized auxiliary equipment: Sub-structure, Pipe Rack, Truck Ramp and Adjustable Stairs.

A wide range of sizes and capacities enables an operator to choose a mast to fit the job.

on LAND or SEA

The same Lee C. Moore Mast mounted as an integral part of a barge drilling unit, built by the Livingston Shipbuilding Co. The soundness of design and integrity of materials made it readily adaptable to this unit. When standard derrick capacities plus portability are required the Lee C. Moore self-supporting mast will meet all requirements.



Showing mast in lowered position with all lines strung, ready for [illegible] tide water location.

LEE C. MOORE & COMPANY, INC.

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 7, 1946

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	31	15	0	*16	41,722	1,079	987	0	0	0	0	0	0	0	0	0	0
Pennsylvania	78	41	10	†27	121,767	2,717	2,825	0	0	0	0	0	0	0	0	0	0
West Virginia	17	7	9	1	50,245	493	556	0	0	0	0	0	0	0	0	0	0
Ohio	20	6	9	5	56,753	816	623	0	0	0	0	0	2	0	11	25	38
Indiana	9	4	0	5	17,828	249	132	0	0	0	1	1	2	0	0	13	15
Kentucky	11	2	3	6	19,703	333	357	0	0	0	1	1	3	0	0	31	34
Illinois	38	18	0	20	92,460	1,506	1,189	1	0	0	10	11	31	0	1	284	316
Michigan	25	8	5	12	50,457	561	510	0	0	0	8	8	17	0	5	182	204
Kansas	37	23	2	12	113,046	1,352	1,161	0	0	0	4	4	21	0	1	175	197
Neb., Mo., Iowa	0	0	0	0	0	15	18	0	0	0	0	0	0	0	0	11	11
Oklahoma	55	28	10	‡17	150,830	1,809	1,637	0	0	0	2	2	59	0	29	217	305
Texas	185	119	10	56	776,877	5,490	4,911	15	0	0	29	44	147	21	21	898	1,087
North Central	76	39	3	34	191,354	1,973	1,497	7	0	0	14	21	44	0	2	373	419
West	40	35	0	5	210,587	1,176	1,237	2	0	0	4	6	36	0	1	124	161
Panhandle	9	5	4	0	27,829	226	389	0	0	0	0	0	0	0	0	5	5
Eastern	13	8	2	3	74,915	507	228	3	0	0	2	5	14	0	2	64	80
Gulf Coast	37	27	1	9	248,243	1,200	1,107	3	0	0	4	7	35	19	8	177	239
Southwest	10	5	0	5	23,949	408	453	0	0	0	5	5	18	2	8	155	183
Louisiana	35	25	3	7	187,702	918	705	0	0	0	1	1	39	7	7	119	172
Northern	15	10	3	2	46,649	508	271	0	0	0	1	1	8	0	2	68	78
Southern	20	15	0	5	141,053	410	434	0	0	0	0	0	31	7	5	51	94
Arkansas	2	2	0	0	4,896	120	122	0	0	0	0	0	5	0	0	26	31
Mississippi	4	2	0	2	39,355	164	243	0	0	0	1	1	1	0	1	46	48
Southeastern States	0	0	0	0	0	29	40	0	0	0	0	0	1	0	0	24	25
Montana	12	7	3	2	22,017	214	214	0	0	0	0	0	9	0	1	23	33
Wyoming	2	1	0	1	3,377	120	140	0	0	0	1	1	11	0	3	29	43
Colorado-Utah	3	3	0	0	19,657	97	26	0	0	0	0	0	4	0	0	11	15
New Mexico	14	11	1	2	62,949	260	297	0	0	0	2	2	3	0	0	27	30
California	18	15	1	2	109,281	1,150	1,615	0	0	0	2	2	14	0	3	151	168
Total United States	596	337	66	193	1,940,922	19,492	18,308	16	0	0	62	78	369	28	83	2,292	2,772
Total previous week	604	331	63	210	2,005,044	18,896	17,751	20	0	1	88	109	353	28	83	2,230	2,694
Total Sept. 8, 1945	557	284	56	217	1,872,755			16	0	2	73	91	359	17	99	2,336	2,811

Service wells included: *16, †27, ‡5.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	$1.41	....
20-20.9	1.24	$1.20	1.43	1.07
21-21.9	1.28	1.22	1.45	1.09
22-22.9	1.32	1.24	1.47	1.11
23-23.9	1.35	1.26	1.49	1.13
24-24.9	1.39	1.28	1.51	1.15
25-25.9	1.43	1.30	1.53	1.17
26-26.9	1.46	1.32	1.55	1.19
27-27.9	1.50	1.34	1.57	1.21
28-28.9	1.54	1.36	1.59	1.23
29-29.9	1.57	1.38	1.61	1.25
30-30.9	1.61	1.40	1.63	1.27
31-31.9	....	1.42	1.65	1.29
32-32.9	....	1.44	1.67	1.31
33-33.9	....	1.46	1.69	1.33
34-34.9	....	1.48	1.71	1.35
35-35.9	....	1.50	1.73	1.37
36-36.9	....	1.52	1.75	1.39
37-37.9	....	1.54	1.77	1.41
38-38.9	....	1.56	1.79	1.43
39-39.9	....	1.58	1.81	1.45
40 and above	....	1.60	1.83	1.47

*Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday. Crude prices reflect latest 25-cent advance except in California and Pennsylvania where no increase had been made as of Monday morning, July 29.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-78½†	73-75
Mid-Continent*	7.500-7.750	6.875-7.000
Tex. Gulf Coast	7.250	6.500-6.750
New York Harbor	8.750-9.500	7.750-8.500
California		7.000-7.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	4.500	5.400
N. Texas (f.o.b. plant)	4.000	4.800
N. Louisiana (f.o.b. plant)	4.250	5.100
California (averages)	5.500	6.250

CRUDE-OIL PRICES

Representative posted schedules per bbl.

East Texas	$1.60
Kettleman Hills, California*	1.69
Beauregard Parish	1.55
Illinois Basin	1.72
Pecos County, Texas	1.30
Bradford, Pennsylvania	3.41
Eastern Ill., and Western Ind.	1.57

Note: Exclusive of subsidy.
*For 37-37.9 gravity.

A.P.I. REFINERY REPORT

Week ended August 31, 1946
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Distillate	Residual
East Coast	783	22,703	18,419	10,661
Appalachian	167	3,167	643	443
Ill., Ind., Ky.	815	15,490	7,559	5,088
Okla., Kan., Mo.	391	8,166	3,368	1,386
Inland Texas	226	2,571	608	758
Tex. Gulf Cst.	1,207	12,648	7,606	5,784
La. Gulf Cst.	366	4,517	3,117	1,713
N. La., Ark.	60	1,445	476	181
Rocky Mt.	140	1,441	557	761
California	756	15,069	10,781	26,398
Total 8-31-46	4,911	87,217	53,134	53,173
Total 8-24-46	4,866	86,251	51,405	52,061
Total 9- 1-45	4,638	84,003	41,245	47,048

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
August 31, 1946	227,132,000
August 24, 1946	225,672,000
September 1, 1945	215,169,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Sept. 7 crude oil	B. of M. Sept. demand	Aug. 31 crude oil
Alabama	1,050	1,200	1,150
Arkansas	79,000	78,000	78,600
California	857,500	855,000	875,400
Colorado	34,570	31,000	32,700
Eastern	64,500	65,000	65,500
Florida	100	200	150
Illinois	208,600	214,000	209,300
Indiana	19,900	19,000	19,400
Kansas	279,550	264,000	279,550
Kentucky	31,000	31,000	30,650
Louisiana	398,200	384,000	397,150
North Louisiana	94,300	.....	93,350
South Louisiana	303,900	.....	303,800
Michigan	46,700	47,000	46,677
Mississippi	72,850	61,000	72,300
Montana	24,350	24,000	25,300
Nebraska	700	800	700
New Mexico	100,000	100,000	100,850
Oklahoma	384,200	386,000	385,500
Texas	2,092,700	2,120,000	2,119,800
District 1 (Southwest)	19,400	.....	19,500
District 2 (Southwest)	149,300	.....	155,100
District 4 (Southwest)	220,500	.....	224,300
District 3 (Gulf Coast)	467,950	.....	486,550
District 5 (Eastern)	41,300	.....	43,050
District 6 (Eastern)	103,900	.....	105,650
East Texas field	324,700	.....	317,000
District 7C (West)	27,250	.....	27,900
District 8 (West)	491,050	.....	490,600
District 7B (W. Central)	32,800	.....	32,650
District 9 (N. Central)	129,550	.....	132,700
District 10 (Panhandle)	85,000	.....	84,800
Wyoming	105,550	108,000	112,100
Miscellaneous other	.....	800	.....
Total United States	*4,801,020	4,790,000	4,852,777
Change from prev. week	down 51,757		

Total production January 1-September 7 †1,184,712,267 bbl.
Same period last year (crude, plus condensate) 1,205,012,175 bbl.
*Not incl. 22,200 bbl. condensate. †Incl. 6,107,800 bbl. condensate.

CRUDE-OIL STOCKS 227,132,000 bbl. as of August 31—up 1,460,000 bbl. One year ago 215,169,000 bbl.

GASOLINE STOCKS 87,217,000 bbl. as of August 31—up 966,000 bbl. One year ago 84,003,000 bbl.

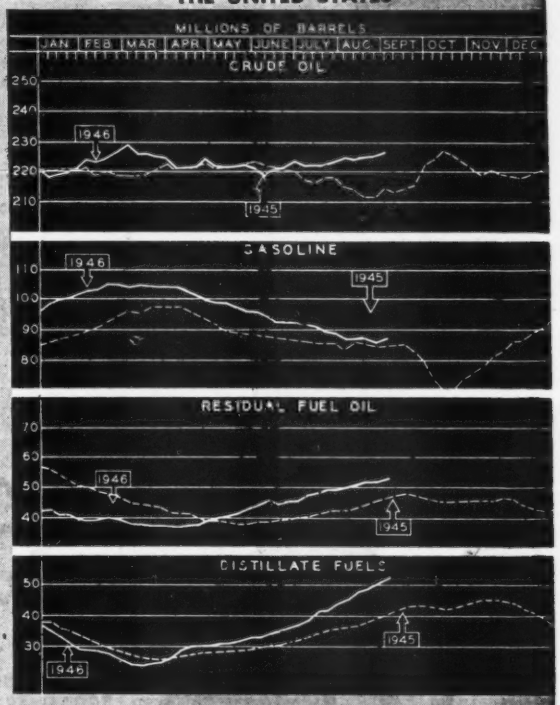
RESIDUAL FUEL-OIL STOCKS 53,173,000 bbl. as of August 31—up 1,112,000 bbl. One year ago 47,048,000 bbl.

GAS OIL AND DISTILLATE STOCKS 53,134,000 bbl. as of August 31—up 1,729,000 bbl. One year ago 41,245,000 bbl.

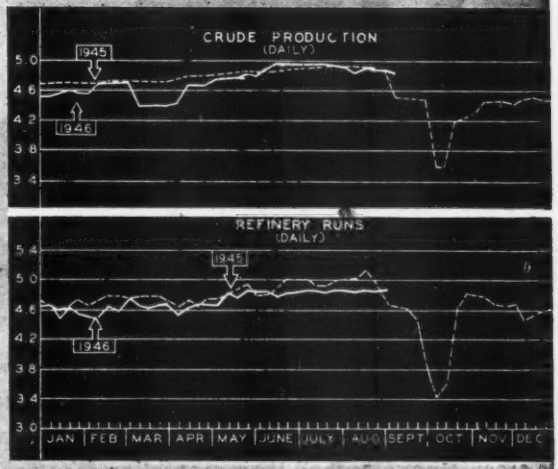
CRUDE-OIL PRODUCTION 4,801,020 bbl. as of September 7—down 51,757 bbl. One year ago 4,525,750 bbl.

REFINERY RUNS 4,911,000 bbl. daily week ended August 31—up 45,000 bbl. One year ago 4,638,000 bbl.

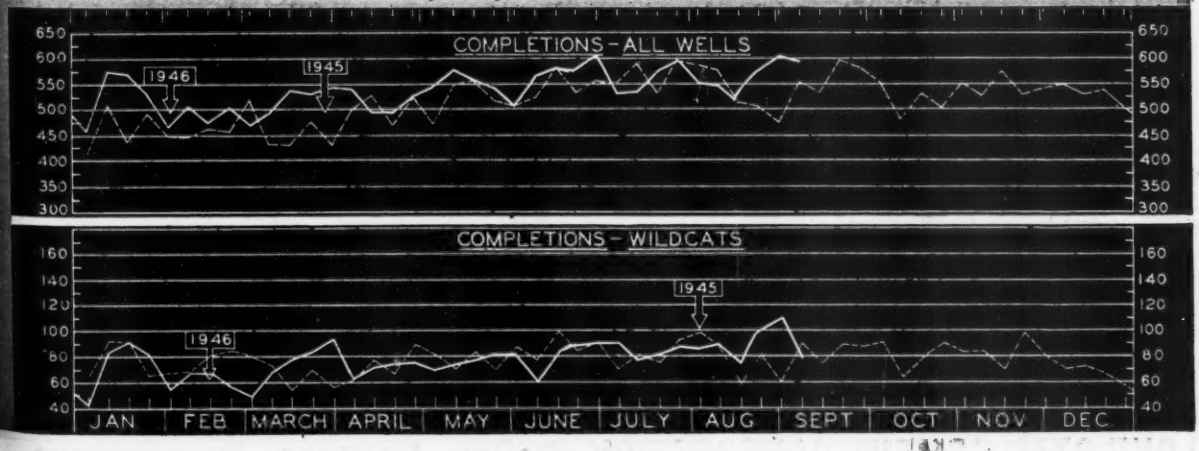
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included

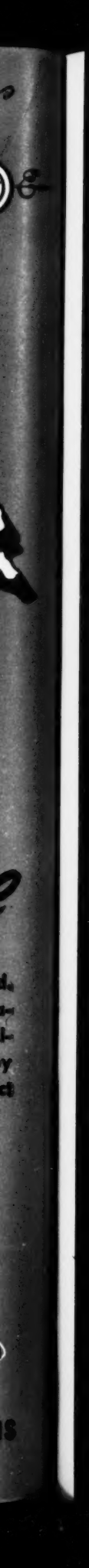


Where Quality means Performance

On the basis of outstanding quality, demonstrated by performance in thousands of wells in the principal oil-producing areas, Lone Star Cements have earned their reputation for year-in-and-year-out reliability. The point to bear in mind is that Lone Star performance is pre-tested to assure the specific properties Oil Men need. Backed by continuing Oil Well Cement Laboratory research to keep cement abreast of oil-industry progress. Protect your investment by using these pre-tested Oil Field cements—select the one that fits your job.

SELECT CEMENT TO FIT THE JOB

LONE STAR CEMENT CORPORATION Dallas • Houston • New Orleans



Exploration and Drilling

A New Angle on Oil Accumulation

BASIC research often turns up sidelight developments of some importance that were far from the minds of the researchers when they started. The Penn Grade Crude Oil Association's research on clays is a case in point. The work started with the practical problem of reducing plugging of the sands in water-intake wells, but soon moved into pure research on clays, and is getting important results along the lines of its primary objective.

One of the first byproducts, however, was the discovery of the effect of the pH value of water on the relative permeability of sandstones. This turned out to be of interest to rotary mud engineers, confirming some of their work, and also aroused interest of some geologists interested in sedimentation problems. (See The Oil and Gas Journal, July 6, page 123). There are still other possibilities that may result from this work.

Now the report of another experiment on clays raises some questions about the mechanism of oil accumulation. In running some routine differential thermal analysis checks on clays from the Third Bradford sand for identification of clay types, a test was run on a sample of the shale breaks in the sand. The temperature curves on the clays from the oil sand showed characteristic humps due to exothermic reactions of organic material, which was to be expected. But the temperature curve on the clay from the shale break in the sand showed no such humps.

Thus, although this is a shale interbedded with an oil sand, the indication is that it has adsorbed no organic material from the oil. No one thought this shale was the source bed for the sand, but how did the oil accumulate in the sand above and below the shale parting without affecting the shale?

The oil migrated into the sand from some source bed, and is both above and below the shale. Is the capillary attraction of shale and sand relative to water and oil sufficient to account for complete absence of organic material from the shale? Perhaps, but it is difficult to conceive of 100 per cent results.

The suggestion has naturally been made that it would be interesting to use the differential-thermal-analysis method on suspected source beds and adjacent reservoir beds to see what light can be thrown on the genesis and migration of the oil. The idea has merit, even though the problem obviously isn't quite that simple. Complications are apparent.

Even if the suspected source bed is the true one, its organic residues of today are unlikely to be what they were before the oil migrated. Also what complications will be encountered if the clays of the reservoir bed and the source beds are of different types? On the whole, however, provided too much is not expected, it looks like a worth-while field for some research.

SOUTH LOUISIANA

New Gas Pool in North Cankton

NEW ORLEANS.—A new gas-producing sand in the North Cankton field of St. Landry Parish has been opened by Humble Oil & Refining Co. 1 Vincent Boagni, 48-8s-4e. Drilled to a total depth of 11,271 ft., before being plugged back, the 5½-in. pipe was cemented at 3,142 ft. and perforated with 10 shots from 3,064-65 ft. It flowed 675,000 cu. ft. of gas at a daily rate on a 6-hour test through a 3/16-in. choke with 1,259 lb. flowing pressure on the tubing. This is a new shallow sand for the field.

Another producer has been completed in the Mamou pool of Evangeline Parish. Magnolia Petroleum Co. 1 Morein-Landreneua Unit, 6-5s-1e, west offset to the 1 Morein discovery well, flowed a potential of 265 bbl. of 36° gravity oil per day through a 9/64-in. choke, gas-oil ratio 753 to 1, tubing pressure 1,500 lb. Total depth is 12,075 ft., with top of sand at 11,774 ft. Production is through perforations at 11,-774-784 ft.

In the Gulf of Mexico, off shore from Terrebonne Parish, Magnolia Petroleum Co. has started the first of a scheduled four deep wildcat explorations. The first test is 1 State-Mineral lease 673 on Tract 474, Block 58, 6 miles out from Point Au Fer field. Operators are drilling ahead below 1,800 ft.

In the Alliance area of Plaquemines Parish, 3 miles southeast of production in the Bayou de Fleur field, The California Co. 4 E. P. Brady, deep wildcat test, is drilling below 14,231 ft. in shale. It is reported that sands showing oil and gas have been encountered.

Four new wildcats have been staked in the South Louisiana district. In Iberville Parish, Humble Oil & Refining Co. 1 Iberville Parish School Board, in 16-11s-12e, will be drilled to 12,000 ft. In St. Mary Parish, Magnolia 1 State Lease 684, Block 94, is a 3,000-ft. test. Also in St. Mary Parish, Amerada Petroleum Corp. 1 Lagermann-Lacy, 47-14s-9e, is to be drilled to 7,500 ft. In Beauregard Parish, Atlantic Refining Co. 1 Newport Industries, Inc., wildcat in northwest Juanita area, 11-5s-12w, is contracted to 12,000 ft.

All six completions this week, five oil and one dry, were in proven fields, two in Jefferson Parish, one each in Acadia, Evangeline, St. James and St. Landry parishes. The dry hole is in St. James Parish.

SOUTHWEST TEXAS

Brooks County Gets New Condensate Pool

CORPUS CHRISTI.—A new gas-condensate pool has been opened in northeast Brooks County, 4½ miles southeast of Falfurrias, by Sun Oil Co. 6 D. J. Sullivan. Drilled to a total depth of 13,206 ft., with 5-in. casing set at 12,180 ft., this well gaged 102 bbl. of condensate through a ¼-in. choke on last 24-hour test, with 1,640 lb. working pressure, and 7,560,000 cu. ft. of gas per day. Production is through perforations at 10,275-10,293 ft. and 10,155-80 ft.

New oil pool opener, Sun Oil Co. 1 M. L. Patton, 6 miles west of Goliad in Goliad County, gaged a potential of 33 bbl. of oil and 34 bbl. of salt water per day through a 3/16-in. choke with 60 lb. trap pressure on casing and 450 lb. tubing pressure. Gas-oil ratio 5,210 to 1. Production is through perforations at 10,672-77 ft. Top of pay 10,670 ft. Total depth 10,765 ft.

In the southwest extension area of Pearsall field in Frio County, Snowden Oil & Gas Co., Ltd., 1 A. Fredrickson, is waiting on pump for final completion. After using 4,000 gal. of acid, well flowed 30 bbl. of oil per day through perforations at 6,160-70 ft. in the Georgetown lime. Drilled to a total depth of 6,357 ft. in Edwards lime, topped at 6,310 ft., with only a light gas show in Edwards. It also tested the Buda lime at 5,904-6,070 ft. but failed to get any production after acidizing.

J. W. Gorman et al 2 Florence D. Lowe, wildcat 1½ miles northeast of Labbe field in Duval County, cored oil sand at 2,444-49 ft., in Government Wells zone. Attempted a drill-stem test but seat slipped and test failed. Operators ran electrical log to total depth 2,705 ft., casing was set to 2,480 ft. and operators will perforate for production test.

H. H. Howell has asked for discovery allowable rights to apply to his Texas Co. well 1, new well south of previous production at Piedras Pintas (South) field, in Duval County, and for a new field designation for the area surrounding this well.

Thirty new locations, 5 being wildcats, were reported this week. The exploratory tests are located 1 each in Brooks, Caldwell, and Refugio, and 2 in Live Oak County. There were 8 wildcat failures, 1 each in Bexar, Caldwell, Duval, Jim Hogg, Jim Wells, Karnes, Kleberg, and Zapata counties. There were 17 oil wells, 1 gas and 9 dry completions this week. All producers are in proven areas.

SOUTHWEST TEXAS WILDCAT FAILURES

Bexar County: W. D. King 1 Tondre, in M. E. Howeth Sur., 8 mi. W of Mc-

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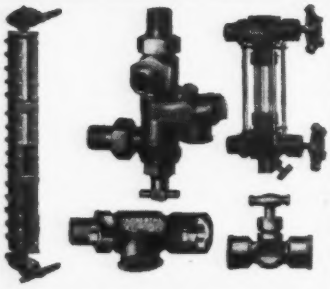

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Donna, 1½ mi. NE of LaCoste, dry, TD 1,046 ft.

Caldwell County: Norman Germany 1 D. Arnio, in John W. Bryan Sur., 3 mi. W of McMahon and 7 mi. SE of Lockhart, dry, TD 2,726 ft.

Duval County: Santa Clara Oil Co. and Progress Pet., Inc. and John F. Camp 1 Geo. B. Buescher, in Diego Hinojosa grant, 6 mi. N of Hebbronville, dry, TD 4,511 ft.

Jim Hogg County: Sun Oil Co. 18 Weil Bros., in Santo Domingo de Abajo grant, 6 mi. S of Weil field, dry, TD 5,904 ft.

Jim Wells County: Sun Oil Co. 1 H. T. Sain, in M. Farias "Los Presenos de Arriba" grant, 2½ mi. NE of Alice, dry, TD 5,480 ft.

Karnes County: Transwestern Oil Co. and Newman Bros. 1 Hattie Hunt Robertson, in L. Navarette Sur., 19 mi. SE of Kenedy, dry, TD 8,008 ft.

Kleberg County: Kilgore Developers 1 H. Lehmann, in Kleberg Town & Impr. Co. subdivision, 5½ mi. SE of Kingsville, junked, dry, TD 8,599 ft.

Zapata County: Hays-Daubert 1 Filiberto Pena, in E. K. Bateman subdivision of El Pedernal grant, 15 mi. N of Roma, dry, TD 1,764 ft.

PERMIAN BASIN

NW Mitchell County Has New Pool Opener

MIDLAND.—A new area has been opened in Mitchell County 4 miles northwest of the north end of the Westbrook field at C. E. Beavers 1 S. R. Coleman, Section 70, Block 97, H&TC Survey. The well was drilled to 2,770 ft., bailed drilling mud and drilling water, and found 200 ft. of 27° gravity oil in bottom of the hole. Bailer was run hourly for 36 hours and recovery averaged 30 gal. of clean oil per hour. It then pumped between 50 to 60 bbl. of oil, natural, in 15 hours. Operator will acidize. Pay is in the Clear Fork, topped at 2,550 ft., the same formation as that found productive in the Westbrook field.

Superior Oil Co. 4-12-A University, Section 16, Block 22, University Lands, west offset to the discovery well in the Block 12 field in southwestern Andrews County, after acidizing with 8,000 gal. through perforations from 7,063-7,141 ft., has been completed to flow 248 bbl. daily through 24/68-in. choke. Gravity of the oil was 33.6°, gas-oil ratio 871 cu. ft. The third producer for the field, 3-A-12 University, 1 mile south of the discovery, flowed at the rate of 22.6 bbl. hourly the last 6 hours of a 12-hour test. The test was through perforations from 7,061-7,130 ft., and gas-oil ratio was 569 cu. ft. Preparations were being made to complete.

Cities Service Oil Co. 1 J. E. Parker, Section 20, Block 44, T-2-S, T&P Survey, deep test west of the Harper pool in Ector County, perforated casing with 76 shots from 12,226-245 ft. and 40 shots from 12,210-220 ft. On a 2-hour drill-stem test through both sets of perforations, recovery was 120 ft. of mud and 90 ft. of mud cut with salt water with a rainbow show of oil. The zone tested was the Simpson. The test had failed in the Ellenburger. Casing will be perforated from 11,362-416 ft. to test the Silurian.

Stanolind Oil & Gas Co. 1-GG University, Section 12, Block 39, University Lands, Ellenburger discovery in northeastern Crockett County, 12 miles southeast of the Barnhart pool and 24 miles northeast of the Todd Deep pool, is bottomed at 8,384 ft. with 7-in. casing cemented at 8,298 ft. On a 17-hour swabbing test, 173 bbl. of oil and 16 bbl. of basic sediment and water were recovered. The swab line parted and operator was trying to recover lost tool.

American Liberty Oil Co. 1 Connell-Young, Section 56, Block 5, H&GN Survey, 1 mile northwest of the discovery well of the Polar field in Kent County, ran a 40-minute drill-stem test from 7,776-7,875 ft., using a 1,500-ft. water blanket. It recovered the water blanket and 100 ft. of mud with no shows. Then a 30-minute drill-stem test was made from 7,850-7,925 ft. and 990 ft. of black sulfur water with no show was recovered. It was shut down for orders. One-half mile northeast of the discovery well, Humble 1 Mrs. Irene Elkins, Section 36, Block 5, H&GN Survey, was drilling below 6,369 ft. in shale.

Sharon Ridge field, Scurry County, had five completions this week and Welch field, Dawson County, and Keystone-Ellenburger field, Winkler County, each had four. Block 12 field, Andrews County, had 12 locations and Wasson field, Yoakum County, Welch field and TXL-Ellenburger field, Ector County, each had two. TXL field has 38 drilling wells; Fullerton field, Andrews County, 30; Block 12 field, 27; Keystone-Ellenburger field, 18; Todd Deep field, Crockett County, 10; Welch field and Wheeler-Ellenburger field, Ector and Winkler counties, each 7; Keystone-Holt field, Winkler County, and North Goldsmith field, Ector County, each 6 and North Monahans field, Ward County, and Keystone-Colby field, Winkler County, each 5.

WEST TEXAS SUCCESSFUL WILDCATS

Crockett County: New oil pool—Moore Exploration Co. et al 1 Halff-Bivens, Sec. 75, Blk. 1, I&GN Sur., 2½ mi. SW Noelke pool, elev. 2,175 ft., pumped 3 bbl. day, perf. 2,692-2,710 ft., Glorietta, gravity 33°, TD 7,512 ft.

Gaines County: Extension to old oil pool—Humble 1 Cunningham, Sec. 7, Blk. A-24, PSL Sur., 1⅞ mi. NW Doss pool, elev. 3,357 ft., flowed 388 bbl. day through 21/64-in. choke on 2-in. tubing, perf. 7,000-60 ft. Clear Fork, gravity 38°, gas-oil ratio 858 to 1, TD 7,135 ft.

WEST TEXAS WILDCAT FAILURES

Andrews County: Texas Gulf Prod. Co. 1 University Lse. No. 4, Sec. 30, Blk. 9, University Lands, 1 mi. NE Emma pool, elev. 3,174 ft., Grayburg 3,990 ft., San Andres 4,370 ft., dry, TD 4,504 ft.

Crane County: Humble 1-B G. H. Cowden et al, Sec. 14, Blk. X, CCSD&RGNG Sur., 5 mi. SW Crane, elev. 2,560 ft., Devonian 7,874 ft., Simpson 8,995 ft., Ellenburger 9,930 ft., dry, TD 10,192 ft.

Ector County: E. E. Fogelson and Cosden Petroleum 1-D University, Sec. 1, Blk. 35, University lands, north end of Penwell pool and 2 mi. SW Phillips 1 Eidson, elev. 2,910 ft., Devonian 7,265 ft., Silurian 7,815 ft., Ellenburger 9,326 ft., TD 9,356 ft.

Pecos County: R. J. Channell 4 University, Sec. 15, Blk. 20, University lands, 4 mi. NW Taylor-Link, elev. 2,558 ft., dry, TD 1,390 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Tide Water Associated Oil Co. 1 Brunson, 4-22s-37e, ⅜ mile north-

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east extension to the Brunson-Ellenburger field in central east Lea County, flowed 567 bbl. of pipe-line oil in 16 hours. Production was through perforations from 7,585-87 ft. The pipe was to be perforated from 7,572-85 ft. with six shots to the foot and reperforated from 7,585-87 ft. with two shots to the foot before completion. Ellenburger was topped at 7,393 ft. This is the highest well structurally in the field. A 1⅛-mile southeast outpost to the field, Rowan Drilling Co. and Neville G. Penrose, Inc. 3 Walden, 15-22s-37e, has been completed for 722 bbl. of oil daily, natural, through perforations from 7,497-7,556 ft.

Pure Oil Co. 1 Federal, 31-3n-38e, a wildcat 13 miles east of Fort Sumner, DeBaca County, cored from 6,261-66 ft., and recovered 3½ ft. of sand with a slight show of gas. Operator was coring ahead. Magnolia Petroleum Co. 1 Black Hills unit, 31-17s-20e, a Chaves County wildcat 25 miles west of Artesia, was drilling below 3,160 ft. in dolomite.

Drinkard field, Lea County, had three completions, Langlie-Mattix field, Lea County, two, and Brunson, Blinebry, Paddock and Maljamar fields, Lea County, one each. Caprock field, Chaves and Lea counties, had six locations, Drinkard field five and Russell field, Eddy County, two. Drinkard field has 17 drilling wells; Grayburg-Jackson field, Eddy County, 14; Paddock field, 10; Square Lakes field, Eddy County, 8; Brunson field, 6¼ Langlie-Mattix field, 5, and Maljamar and Russell fields, Eddy County, 4.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Eddy County: Monsen 1 State, 39-19s-28e, 2 mi. N Russell pool, elev. 3,296 ft., dry in Yates, TD 1,447 ft.

Lea County: Repollo Oil 1 J. E. Simmons, 25-21s-37e, deep test Drinkard field, elev. 3,390 ft., Devonian 7,805 ft., Silurian 8,317 ft., dry, TD 8,756 ft.

ROCKY MOUNTAIN

Sheldon Dome Test Finds Thick Embar Pay Section

DENVER.—A discovery on the Sheldon Dome, Fremont County, Wyoming, a year ago in Kerlyn-Phillips-Carter 1 Tribal, NE NE 16-5n-2w, again is in the limelight due to the working over and testing of additional zones in the Embar formation. It was drilled originally to 6,974 ft., 231 ft. in the Tensleep, plugged back to the Embar, topped at 6,235 ft., casing perforated at 6,265-80 ft., acidized with 500 gal. and made around 55 bbl. per hour of 36.2° gravity oil.

Three zones in the Embar which showed oil on drill-stem tests were not tested at the time. Although the average thickness of the Embar is around 200 to 250 ft., this well has around 600 ft. This thickening is credited to an overthrust, the drill going back into the same formation and drilling through a horizon that was practically a duplicate of the upper part.

Recently the operator went back into the well, squeezed off the perforations at 6,265-80 ft. and perforated at 6,310-50 ft., acidized with 500 gal. It flowed 731 bbl. of fluid in 18 hours, 60 per cent water, tubing pressure 250 psi. Testing through additional perforations at 6,350-6,410 ft. showed similar results. The last test made was at the bottom of the formation where water normally would be expected through perforations with 160 shots at 6,545-6,600 ft. After acidizing with 500 gal. it started flowing 40 bbl. per hour through a ⅜-in. choke. The next day it made 45 bbl. of which 57 per cent was water, with tubing pressure of 300 psi. Testing continued through chokes of varying sizes with pressure holding up, quantity of oil increasing and water showing some decrease. Between these zones is another which on an electric survey showed greater porosity than any other and still remains to be tested.

It is estimated that the combined flows from the several zones would be several thousand barrels on the basis of showings already made. The gravity of the oil is about the same in all the zones so far tested. The oil and water separate naturally and offer no serious operating problem as there is no emulsion.

Southeastern Colorado play.—Location for the second of several exploratory wells to be drilled in southeastern Colorado where a big lease play has been under way for some time was released. It is The California Co. 1 Luster, SE NE 10-22s-47w, Wiley District, Prowers County, 5 miles northwest of Lamar, and Kerr-McGee Oil Industries, Inc., has the contract to go to 5,800 ft.

Iles deep test.—Stanolind Oil & Gas Co. 1 Madison, SW SE 22-4n-92w, Iles field, Moffat County, a deep test to the Weber and Madison, was drilled to 7,487 ft., and is plugging back to complete in the Sundance, the field's principal producing horizon. It was through the Madison at 7,480 ft., and encountered salt water. Top of the Weber was at 4,572 ft.

Madison wells in Cut Bank.—T. L. Brook 1 Bilstad, NW NW SE 4-36-5w, 3 miles east and a little north of Carter Oil Co. 1 Bridley, the Madison lime discovery in the Cut Bank field, had the top of the Madison at 3,008 ft., and in a drill-stem test at 3,012-22 ft., open 40 minutes, recovered 320 ft. of sulfur water and 630 ft. of drilling mud. It is standing and may drill deeper. Texas Co. 1 Stufft-M-245, NW SW 19-36-5w, a

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south offset to Union Oil Co. 1 Stufft, is a near completion, swabbing and flowing 40 bbl. in 14 hours with casing pressure of 200 psi. It will be put on the pump. Top of the Madison was at 3,055 ft., and total depth 3,131 ft.

Cat Creek outpost.—Continental Oil Co. 17 Brown, SW SW SE 17-15n-30e, Mosby Dome, Cat Creek field, Montana, was dry in the Ellis sand at 1,440-75 ft., and in the Brindley sand at 1,095-1,103 ft., and is being completed in the second Cat Creek as a small pumper. It is ½ mile west of the Mosby Dome discovery in the Brindley sand and approximately the same distance south of Continental's 16 Brown which marked the northern limits.

New operations.—Thirteen new operations were reported, of which 3 were in Colorado, 3 in Wyoming, and 7 in Montana. Two of the Colorado locations were in the Rangely field, and one was the California Co. wildcat on the Wiley structure in southeastern Colorado, noted above. The Wyoming locations were one each at Elk Basin, Spence, and Dry Dome. Last named is Kerr-McGee Oil Industries, Inc., and Phillips Petroleum Co. 1 Pauley, NW NW NE 2-50n-92w, on the east side of the Big Horn Basin and on the same line of folding as the Greybull and Lamb structure. The block, comprising 4,200 acres, is unitized. The Montana locations include one at Elk Basin, two at Cut Bank, 3 in Kevin-Sunburst, and 1 in the Bodoin field, all development wells.

WILDCAT FAILURE IN WYOMING

Castle Creek, Natrona County: British-American Oil Prod. Co. 2 Davis, SW NW NE 24-38n-81w, TD 2,268 ft., top First Frontier 1,775 ft., Second Frontier 2,115 ft., Third Fontier 2,261 ft., swbd. 24 bbl. of fluid, 5 per cent oil, from Third Frontier, plugged back and abd.

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TEXAS GULF COAST

New Condensate Pool For Matagorda County

HOUSTON.—A new gas-condensate pool for Matagorda County has been opened by Ralph A. Johnston 1 Live Oak Farms in Josiah Tilley League, 2 miles northeast of Blessing townsite. Located 4,500 ft. south of the Tidehaven (El Maton) pool opened several weeks ago by Magnolia Petroleum Co. as an oiler, the discovery is reported to be producing from a different sand on a different structure. Drilled to a total depth of 9,002 ft. this new gas-condensate producer was completed through perforations at 8,756-72 ft. flowing gas through two ⅛-in. chokes on double wing, making about 1,000,000 cu. ft. per day through each choke with considerable condensate. Tubing pressure 2,650 lb., casing sealed. No gage was made of the condensate. Sand from 8,751-83 ft., the 5½-in. casing was set at 8,898 ft.

Pan American Production Co. 1 Callihan Unit, discovery well of Liverpool field, in Angier, Hall & Bradley Survey, between the Rowan and Chocolate Bayou fields in Brazoria County, flowed a potential of 331 bbl. of 40° gravity oil in 24 hours through a 12/64-in. choke. Tubing pressure 880 lb. with casing sealed. Gas-oil ratio 525 to 1. Production is through 20 perforations at 8,757-8,762 ft.

A new pool for Fort Bend County, 4 miles southwest of the Clodine pool, has been indicated in O. J. Martin 1 H. B. McCrary et al, in James Knight and W. C. White Survey. On 20-minute drill-stem test from 7,322-32 ft. recovered 13 stands of clean oil, 41° gravity oil, along with water cushion and four more stands of mud cut with oil and gas. Pressure was 1,025 lb., flowing at bottom and 2,625 lb. shut in bottom-hole pressure. Another test at 7,424-36 ft. showed water. Operators are now coring ahead.

New oil production ½ mile southeast of the West Columbia field in Brazoria County has been opened by Hogg Oil Co. 10-A Mike Hogg et al in Martin Varner Survey. On production test through perforations at 6,106-22 ft. in the Frio flowed at the rate of 470 bbl. per day of 33° gravity oil through a ¼-in. choke. Tubing pressure 500 lb., and gas-oil ratio 520 to 1. This is about 300 ft. deeper than producers to the west and is below the water level in other wells in the field. Application has been made for discovery oil allowable rights for this well, and for the area surrounding this well to be given a new field designation. The company plans other wells in the area to develop the new sand. First drilled may be the Hogg 9-A, about 1,900 ft. to the northwest.

A deep wildcat test east of production in the Double Bayou field area of Chambers County, Humble Oil & Refining Co. 2-A Double Bayou Unit 2, R. O. W. McManus Survey, flowed 95 per cent salt water and 5 per cent oil on test through 198 perforations at 9,002-35 ft. Total depth in sidetracked hole is 9,130 ft. with 5½-in. casing cemented to 9,100 ft. Original hole was drilled to depth of 10,347 ft. where pipe became stuck, plugged back to 8,584 ft. for a sidetrack job.

McCarthy Oil & Gas Corp. 1 C. E. Wilbur, wildcat in T&NO Survey, 3½ miles east of Stowell field, in Jefferson County, is reported to have blown out at 9,392 ft. but was controlled. Operators are conditioning mud to drill deeper.

Two new deep wildcat locations have been staked in Brazoria County by McCarthy Oil & Gas Corp. The 1 Marie B. Nickell is 4 miles westerly from Angleton in C. Smith League. Contract depth is 11,500 ft. The 1 T. L. Smith, Jr. et al is 1 mile southeast of West Columbia in J. H. Bell 1½ League. Contract depth is 10,000 ft.

There were 17 new locations this week

with 4 being wildcats, 2 in Brazoria and 1 each in Colorado and Matagorda counties. North Thompson field in Fort Bend County received the greatest activity, reporting five locations. Of the 20 completions, 4 were wildcats, 2 new pays and 1 field opener, and 1 dry hole.

UPPER GULF COAST TEXAS SUCCESSFUL WILDCATS

Brazoria County: New oil pool, Liverpool field: Pan American Production Co. 1 Callahan Unit, Angier - Hall - Bradley Sur., Abst. 6, 1½ mi. SE of Liverpool and ¾ mi. W of Chocolate Bayou field, TD 12,204 ft., PB 8,762 ft., top sand 8,757 ft., perf. 8,757-62 ft., PT 331 bbl. 24 hours through 12/64-in. choke, gas-oil ratio 525 to 1, 40.3° gravity, 4 per cent water.

Brazoria County: New oil sand, West Columbia field—Hogg Oil Co. 10-A Mike Hogg et al, in Martin Varner Survey, TD 7,257 ft., PB TD 6,122 ft., perf. 6,106-22 ft., top sand 6,106 ft., PT 470 bbl. per day through a ¼-in. choke, gas-oil ratio 515 to 1, TP 500 lb., gravity 33°, no water.

Galveston County: New oil sand, Caplan field—Roxoil Drilling, Inc. (Johnny Mitchell et al) 1 R. P. Smith Unit 1, in Minor Knowlton Sur., TD 7,808 ft., top sand 4,031 ft., perf. 4,031-35 ft., PT 61 bbl. per day through a 6/64-in. choke, gas-oil ratio 248 to 1, TP 390 lb., CP 500 lb., 26° gravity, no water.

UPPER GULF COAST WILDCAT FAILURES

Harris County: Fred M. Manning 1 Union National Bank, in Jas. Mellus Sur., Abst. 528, SW of Dyersdale, dry, TD 4,506 ft.

MICHIGAN

Eight Dry Wildcats For the Week

SAGINAW.—Michigan operators reported 25 completions in oil and gas fields for the week while 21 new locations were announced. Nine of the completions and an equal number of new locations were in Allegan County. Completion results showed eight oil producers, five gas wells, 12 dry holes, eight of which were wildcat tests. Initial new potential was but 616 bbl. being located in the new Casco pool of Allegan County. Two other producers were in Monterey Township, Allegan County, one in Hampton-Bay, the other in Tallmadge-Ottawa. Three of the gas wells were drilled in Clare County's Lincoln field. In addition to Allegan, other new locations included four in Clare County, three in Arenac, one each in Ottawa, Missaukee, Van Buren, Newaygo and Genesee.

MICHIGAN WILDCAT FAILURES

Allegan County, Monterey Township: J. W. Lang Co. 1 Henderson, SW SW NW 28-3n-13w, dry in Traverse limestone, TD 1,842 ft.

Bay County, Pinconning Township: Ervin Major-J. O. Mutch 1 Flies, SE SE NE 16-17n-4e, dry in Dundee, TD 3,236 ft.

Iosco County, Burleigh Township: Gulf Refining Co. 1 Beardslee, SW NW SE 4-21n-5e, dry in Dundee, TD 3,315 ft.

Isabella County, Coe Township: H. E. Bell 1 Bates, SW NW SW 12-13n-3w, dry, TD 1,570 ft.

Fremont Township: Union Drilling & Producing Co. 1 Charles M. Hall, et al, NE NW NW 14-13n-5w, dry in Monroe, TD 3,666 ft.

Missaukee County, Caldwell Township: Sun Oil Co. 1 Missaukee Lakes Land

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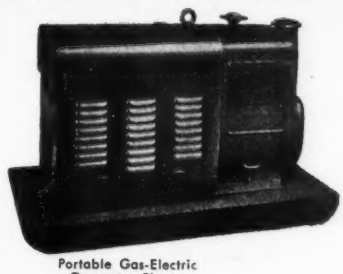

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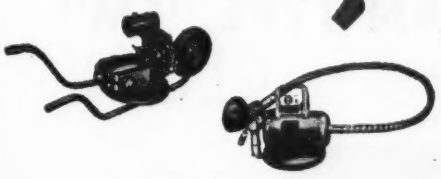

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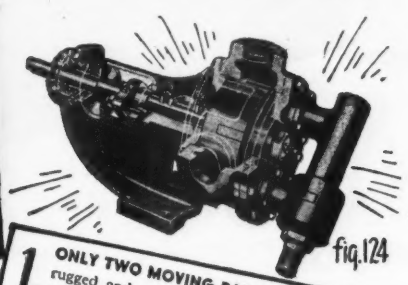

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Co., SW SW SW 28-23n-8w, dry in Dundee, TD 3,889 ft.

Shiawassee County, Wexford Township: Shiawassee Deep Drilling Co. 1 Haight, SE SE SW 10-5n-3e, dry in Alpena, TD 1,609 ft.

Wexford County, Selma Township: George C. Hanners 1 Lang, SW SE NW 11-22n-10w, dry in Monroe, TD 3,847 ft.

N. CENTRAL TEXAS

Montague Co. Test Looks Good

WICHITA FALLS.—Continental Oil Co. 1 John B. Lewis "B," Nancy B. Ussery Survey, Abstract 824, prospective pool opener about 4 miles southwest of Montague, Montague County, took a 4-minute drill-stem test from 6,340-50 ft. There was gas in 1 minute. Recovery was 855 ft. of free oil. Bottom-hole pressure was 2,650 lb. Total depth is 6,402 ft. Electrical survey showed Caddo from 6,176-6,235 ft. and conglomerate from 6,348-6,402 ft. Operator is conditioning hole and preparing to perforate casing for production test. The test is separated by three deep dry holes from the Hildreth field 2½ miles to the northwest.

Fred M. Manning, Inc., 1 Magnolia-Graham Est., Block 985, TE&L Survey, deep test in the Masters pool of eastern Throckmorton County, topped the Caddo at 3,828 ft. It drilled lime with a show of oil from 3,833-43 ft. On a 48-minute drill-stem test of this zone, there was gas to the surface in 5 minutes and 300 ft. of oil was recovered. Operator was drilling ahead.

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Standard Oil Co. of Texas 1 Mitchell, J. B. McNair Survey, deep wildcat 1½ miles northwest of Sherman, Grayson County, topped the Ellenburger at 11,250 ft. with elevation of 751 ft. It was drilled to 11,542 ft. and plugged back to 11,100 ft. to test the Simpson section. Standard of Texas 1 Grayson County, same survey, 3 miles northwest of Sherman, is dry at 5,200 ft.

National field, Wilbarger County, had four completions this week, Electra field, Wichita County, two and Ross Ranch field, King County, Madden field, Wichita County, Wilson field, Cooke County, and Cope field, Young County, one each. Portwood field, Archer County, had five locations, Electra field three, and Cope field two. National field has eight drilling wells, Holliday field, Archer County, seven, Sivell's Bend field, Cooke County, four, and Rose field, Haskell County, Wilson field and Garvey field, Young County, three each.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Archer County: New oil pool—Clyde Gibson 2-A L. W. McCrory, Ttr., Lot 1, Blk. 55, ATNCL Sur., 2 mi. W and 1 mi. N Luke Wilson, elev. 1,023 ft., pumped 50 bbl. day from 1,461-67 ft. Cisco, TD 1,467 ft.

New oil pool: Harvey Drlg. Co. 1-A C. L. Abercrombie, F. M. Taber Sur. A-723, 1 mi. W and 1 mi. N Anarene, pumped 12 bbl. day from 1,273-1,279 ft. Cisco, gravity 40.3°, TD 1,279 ft.

Cooke County: New oil pay—Fred Snuggs et al 1 Almon-Sun, James Randolph Sur., Almon pool, elev. 802 ft., pumped 120 bbl. day through open hole from 3,934-42 ft. Strawn, 25° gravity, TD 3,942 ft.

Young County: Extension to old oil pool—Hassie Hunt Trust 1 Mrs. Wm. M. Harrison, Filepe Jaime Sur. A-157, Knox pool, elev. 1,146 ft., pumped 20 bbl. day from 2,692-99 ft. Strawn, gravity 40°, TD 2,699 ft.

New oil pool—NuEnamel 1 Donnell, Sec. 850, TE&L Sur., 1½ mi. N and 1 mi. W Eliasville, elev. 1,132 ft., pumped 24 bbl. day, perf. 1,766-80 ft. Strawn, TD 3,402 ft.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Fish & Miller 1 Lester West, Blk. 28, G. P. Meade Subd. "L-M Pasture," 2½ mi. N and 2 mi. E Megargel, dry, TD 1,482 ft.

Baylor County: Fain & Riner 1 D. C. Fritz, Blk. 45, H&TC Sur., 1½ mi. S Bomarton, elev. 1,383 ft., dry, TD 1,847 ft.

Scott Bros. 1 Robertson CSL, Robertson CSL Sur., 3 mi. N and 4 mi. E Rendham, elev. 1,204 ft., dry, TD 3,138 ft.

Cooke County: J. B. Heinen 1 J. J. Barnes, Jno. Gregg Sur., ½ mi. N Valley View, Ellenburger 1,770 ft., dry, TD 1,782 ft.

Sinclair Prairie 1 Roxie Dawson, Lot 93, Fannis CSL Sur., 4½ mi. N and 1 mi. E Callisburg, elev. 819 ft., Simpson 6,024 ft., dry, TD 6,065 ft.

Haskell County: T. D. Humphrey 1 Norton, Lot 44, J. Scott Sur., 2½ mi. N and E Haskell, elev. 1,513 ft., Palo Pinto 3,651 ft., dry, TD 3,740 ft.

F. M. Manning 1 F. A. Adair, Sec. 7, Blk. 3, H&TC Sur., 1 mi. N and 1½ mi. E Stamford, elev. 1,484 ft., Palo Pinto 3,203 ft., dry, TD 3,258 ft.

Montague County: J. M. Garrett, A. V. Grant and Geo. L. Pace 1 Varner Pitman, Jas. Ferguson Sur., 7 mi. N Saint Jo, elev. 950 ft., dry, TD 2,222 ft.

Honolulu Oil 1 D. A. Price Est., Francisco Escobar Sur. A-216, 6 mi. N and 1 mi. E Bonita, elev. 841 ft., dry, TD 5,140 ft.

Wichita County: Goforth & Bowers 3 Carl Mertino, GC&SF Sur. A-365, 6½ mi. N and ½ mi. E Burk Station, elev. 1,091 ft., dry, TD 1,527 ft.

Young County: L. T. Burns 1 E. J. Ernst,

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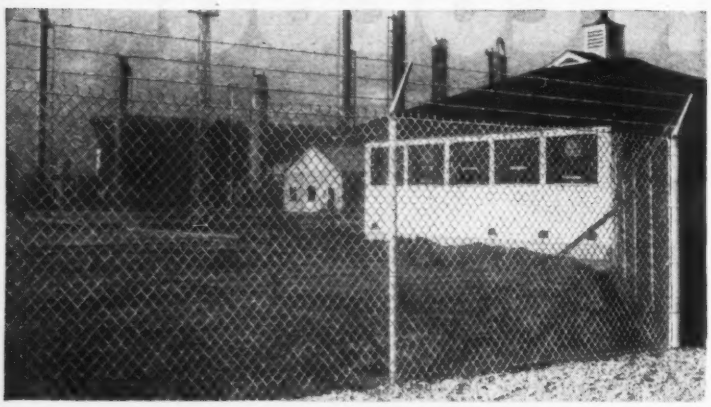

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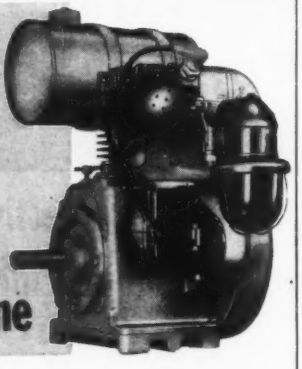

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Sec. 64, TE&L Sur., 6 mi. W and 4 mi. S Olney, elev. 1,214 ft., dry, TD 1,120 ft.

WEST CENTRAL TEXAS

ABILENE.—McCarthy Oil & Gas Co. 1 Wyatt C. Hedrick, Jesse Benton Survey No. 99, Erath County wildcat 6 miles southwest of Bluffdale, took a 35-minute drill-stem test from 4,909-23 ft. It lost 23 ft. of mud and then reported a good blow of air for 15 minutes. Recovery was 400 ft. of heavily oil and gas-cut mud. This well is being drilled "tight." It was drilling below 5,130 ft. in lime. M. E. Hart 1 Morrison Est., David Bruce Survey, new Jones County discovery east of the Reddin field, is estimated good for about 100 bbl. of oil daily after shot of 20 qut. of nitroglycerin. Production is from 2,172-83 ft. in the Flippen sand.

Eolian field, Stephens County, and Shackelford County Regular field each had two completions and Lewis Steffins field, Jones County, had one. Dunigan field, Taylor County, Avoca field, Jones County, and Palo Pinto Regular field each had one location. Jones County Regular field has five drilling wells; Shackelford County Regular field four, Lewis Steffins field and Manning-O'Conner field, Stephens County, three each and Sanders field, Taylor County, and Cisco field, Eastland County, two each.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS

Eastland County: New oil pool—J. D. Sandifer, Jr. 2 T. P. Brawner, Sec. 25, Blk. 2, ET Ry. Sur., 2 mi. NW Rising Star, pumped 28 bbl. day from 1,058-61 ft. Strawn, gravity 38°, TD 1,601 ft.

Palo Pinto County: New oil pool—Palo Pinto Oil & Gas 1 Wesley Roberson, Sec. 53, Blk. 2, T&P Sur., 9 mi. NE Strawn, elev. 1,206 ft., flowed 30 bbl. day through 2-in. tubing from 3,877-86 ft. Marble Falls, gravity 40°, TD 3,886 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Brown County: Messa Drlg. Co. 1 John Schultz, Samuel Bangs Sur., ½ mi. S Bangs, Caddo 1,340 ft., dry, TD 1,340 ft.

Coleman County: Lancaster Bros. 1 M. R. Martin, E. Humphries Sur. No. 96, 7½ mi. SE Santa Anna, elev. 1,486 ft., Caddo 1,264 ft., dry, TD 2,100 ft.

Mills County: Ray Pool 1 F. R. Hines, BBB&C Sur. No. 2 16 mi. NW Goldthwaite, Ellenburger 1,489 ft., dry, TD 1,521 ft.

EASTERN TEXAS

Wood Co. Test Gets Heavy Oil in Woodbine

DALLAS.—Bobby Manziel 1 A. L. Amason, Hazard Anderson Survey, Wood County discovery 5 miles northeast of Quitman, pumped and flowed 269 bbl. of 17.5° gravity oil on a 24-hour official test. Production is from perforations from 5,466-88 ft. in the Woodbine sand. Gas-oil ratio was 178 to 1.

Humble Oil & Refining Co. 1 Hale, J. S. Ables Survey, wildcat 1 mile north of Kemp, Kaufman County, is dry at 6,475 ft. in the Travis Peak, which showed water. The well also showed water in the Woodbine and Paluxy. It missed the pay in the Rodessa zone. Delta Drilling Co. 1 Southern Pine, Z. Gibbs Survey, wildcat 10 miles southwest of Rusk, Cherokee County, is dry at 5,255 ft. Woodbine was topped at 5,200 ft. Elevation is 315 ft. The well is about a mile southwest of W. W. Wise and Delta 1 J. O. Huggins, recent Woodbine discovery.

A. P. Merritt will drill a Smackover lime wildcat in the Aquilla sector of southwestern Hill County. It is 1 Nenry Norris, in the F. A. Tabor Survey, northwest of

West. It will be drilled to around 3,500 ft. Electrical survey was being run at Delta 1-A Gauntt, James Giles Survey, Bowie County wildcat 2 miles west of Simms. It has been drilled to 4,150 ft. in Paluxy sand.

Hawkins field, Wood County, had three completions this week, and Carthage and Bethany fields, Panola County, Pickton field, Hopkins County, and Sand Flat field, Smith County, one each. Hawkins field, Bethany field, Talco field, Franklin County, Jefferson-Lodi field, Marion County, each had one location. Carthage field has 26 drilling wells; Hawkins field 8; Talco field, Titus and Franklin counties, 4, and Sand Flat field, Waskom field, Harrison County, Opelika field, Henderson County, and Quitman and Manziel fields, Wood County, each three.

EASTERN TEXAS SUCCESSFUL WILDCATS

Harrison County: New oil pay—E. C. Johnson 1 Cargill, Simpson Holloway Sur., Waskom gas field, flowed 527 bbl. day through ¼-in. tubing choke, perf. 5,931-44 ft. Travis Peak, gravity 41°, gas-oil ratio 441 to 1, TD 5,944 ft.

Wood County: New oil pay—Rogers Lacy and Carraway 1-A Shamburger, Jas. Moore Sur., Manziel pool, elev. 472 ft., pumped 113 bbl. day, perf. 4,146-66 ft. Sub-Clarksville, gravity 16.2°, TD 6,413 ft.

Magnolia 2 Malone-Taylor Unit No. 2, John Polk Sur., Manziel pool, elev. 471 ft., pumped 261 bbl. day, perf. 4,784-90 ft. Woodbine, gravity 26°, gas-oil ratio 50 to 1, TD 6,585 ft.

EASTERN TEXAS WILDCAT FAILURES

Houston County: Humble 1 C. W. LeGory, Francis Hill Sur., 2½ mi. E Crockett, elev. 385 ft., Austin chalk 6,973 ft., Woodbine 7,317 ft., dry, TD 7,539 ft.

Navarro County: Coffield & Guthrie 1 A. P. Mays, John McNeal Sur., 3 mi. SW Angus, Wolfe City 1,425 ft., Austin chalk 1,924 ft., dry, TD 1,942 ft.

APPALACHIAN FIELD

New Crude Prices Reflect Refining Shifts

PITTSBURGH.—New prices were posted by all of the purchasers of Pennsylvania Grade crude except in that area surrounding Oil City, Pa., and all are retroactive to September 1. The new prices are: Allegany, Bradford, and Tiona, $3.41, increase 6 cents; oil run into the South West Pa. Pipe Lines, $3.20, increase 20 cents; oil run into the Eureka Pipe Line Co., $3.20, increase 26 cents; Penna. Grade oil run into the Buckeye Pipe Line Co., $3.16, increase 26 cents; Zanesville oil run into Buckeye Pipe Line Co., $2.86, increase 26 cents.

The new prices represent an economic shift in the price structure within the Penna. Grade industry. Formerly all prices were based about on a delivered price parity at Oil City, Pa., or the posted price in any district plus the gathering and transportation charges to that oil center were about equal. With the exception of southeast Ohio, where no Penna. Grade refineries are located, the refinery capacities in each district are now more nearly able to process all of the crude produced within that district. Under the new posted prices, the delivered price to any refinery, located within the area of that posted price, is now more nearly the same for all Penna Grade refineries. There are spreads, of course, in the delivered price within the Penna. Grade area but these are occasioned by refinery locations in depleted fields where pipe-line gathering rates are higher due to a low barrel mile ratio and the necessity of servicing widespread, declining fields. Due to declining production, locally, those refineries have had to import crude from other districts with the attendant transportation cost.

The effect to the producer of the crude may not be felt until the subsidy has been removed from all crudes as the revised subsidy plan is interpreted to mean that any increase in posted prices will reduce the subsidy by a similar amount, thus keeping the present over-all return to the producer the same.

The long-range possibility of a greater return per barrel should have a tonic effect upon the declining production in the southwest Pennsylvania, West Virginia fields and stimulate still further recent developments in southeast Ohio.

In Summit Township, Erie County, Pennsylvania, Appalachian Development Co. is testing a wildcat on Merrill K. Meade farm with the Onondaga placed at 2,022 ft., Oriskany 2,281 ft. with 350,000 cu. ft. gas at 2,283 ft. In West Salem Township, Mercer County, Hart & Hickman have made a location on Wm. Kaiser farm for another Oriskany test.

In Portland district, Preston County, West Virginia, the Oriskany wildcat of Wm. E. Snee et al on Harrison Sisler farm, which has been shut down for casing since the gas strike in the chert at 5,622 ft., has blown open for the past week and has shown an increase in volume of 133,000 cu. ft. Casing has been moved in and will be run before drilling through the chert to the Oriskany.

In Mountain Cove district, Fayette County, Godfrey L. Cabot, Inc. completed a wildcat on Raymond Kious farm which gaged 657,000 cu. ft. after shot, from the Salt sand at 1,193-1,257 ft.

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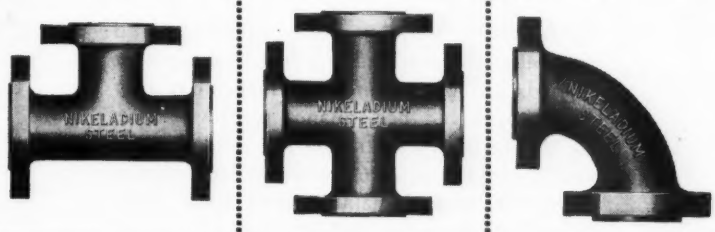

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kany gas field, United Fuel Gas Co. completed fair gas wells. No. 783 Ego Gallati, in Big Sandy district, gaged 7,647,000 cu. ft. natural, with surface elevation 1,060 ft., Oriskany 5,414 ft., total depth 5,438 ft. No. 5,740 Ego Gallati in Elk district had a final open flow after shot of 5,840,000 cu. ft. gas, with surface elevation 1,015 ft., Oriskany 5,312-55 ft., shot 5,305-58 ft., total depth 5,359 ft. Columbian Carbon Co. completed 907 W. H. Vickers with a gage of 3,018,000 cu. ft. after shot, surface elevation 644 ft., Oriskany 4,964-5,029 ft., shot 4,979-5,021 ft., total depth 5,043 ft.

CALIFORNIA

Gardena Prospects Due For Active Testing

LOS ANGELES.—Early determination of additional productive potentialities is in prospect for the newly discovered Gardena district in the western part of Los Angeles County.

In addition to plans for a second well, one location west of the discovery, which are already in process of execution, operators in the area are preparing to expand exploratory and development work. British-American Oil Producing Co., which conducted operations on the discovery well, although a joint interest is held by The Texas Co., is planning, according to reports, the drilling of three directional wells. Deviation profiles call for completing the three wells under Alondra Park for the joint account of British-American, Seaboard Oil Co., and The Texas Co.

The Texas Co., it is understood, has obtained operating interest in 1,100 acres of leases in the Gardena area previously held by Ohio Oil Co. The Texas Co. is planning to start its first well on this acreage and is joined by Seaboard in the program. Ohio retains an overriding royalty.

Experience in completing the first Gardena producer from the basal conglomerate at total depth of 9,154 ft., is expected to prove helpful in establishing successful practices for future wells. The Gardena discovery, British - American and Texas 1 Bodger, 1,640 ft. north and 105 ft. west of the south quarter corner, Section 22-3s-14w, was officially completed during the last week in August from a producing interval at 9,064 to 9,153 ft. The final completion gage was 1,040 bbl. of 26°-gravity oil on chokes varied from 18/64 to 22/64 in.

Rumors circulated last week that Basin Oil Co. 1 Standard Brick, a deep test in the Potrero district, within the corporate limits of Inglewood, Los Angeles County, has encountered encouraging showings of oil. Operators were reported coring around 9,200 ft., but declined to comment on core recoveries or to disclose other details. Location of the well follows the same pattern of "sharp shooting" for structure which prevails in a majority of California exploratory operations. It is between the Inglewood and Athens areas.

In rank wildcat territory in Humboldt County, northern Calfornia, The Texas Co. prepared to set pipe at 7,850 ft. in 2 Holmes-Eureka. Operators ran electric log before setting pipe but this has been normal operating practice and has no particular significance. The well is in the Tompkins Hill area, Section 22-3n-1w, where the company holds extensive acreage and where other exploratory holes have been drilled previously without success.

General Petroleum Corp. started drilling last week at 1 Llano Seco, a wildcat test for gas production in Section 33-20n-1w, Butte County, Sacramento Valley. The well is about 15 miles southwest of Chico.

Belridge Oil Co. continued drilling and spot coring 62-W-33, the closely watched deep test in the old South Belridge field, and is reported progressing below 13,525

ft. The well is in Section 33-28s-21e, and is supported by other operating companies in the district who would benefit by development of deep production on the Belridge structure.

The state's deepest drilling well, Pacific Western Oil Co. 1 National Royalties, Section 5-26s-22e, in the Miramonte area, Kern County, continues making hole below 14,200 ft. Operators intend to explore Vedder possibilities under this location. If realized, this may require a new drilling depth record.

Possibilities of Miocene production southeast of the Newhall-Potrero field in Los Angeles County may be determined soon at Seaboard 1 Mission Land Co., Section 25-3n-16w, about 3 miles northwest of San Fernando. Operators were delayed last week in obtaining a formation test at 7,125 ft. when packer stuck and a fishing job is now in progress.

Natural Gas Corp., an operating subsidiary of Pacific Public Service Co., completed its first gas well in the Trico field of Kings County, for production of 6,000,000 cu. ft. daily through ½-in. choke.

CALIFORNIA WILDCAT FAILURES

Orange County, West Newport area: Sunset Oil Co. 1 Meyer, 17-6s-10w, TD 6,089 ft., dry.

Kern County, Arvin area: Gene Reid Exploration Co. 1 Angus, 19-31s-30e, top granite 4,570 ft., formation test 4,570-4,605 ft., recovered mud, TD 4,605 ft., dry.

ILLINOIS

Clay City Field Well Flows 2,210 Bbl. Daily

MATTOON.—The A. J. Slagter, Jr., 1 Russel Pierce, NE NE SE 22-2n-8e, on the eastern edge of the Clay City Consolidated field, has been completed as the best oil well in that area to date. Following an acid treatment of 5,000 gal. in the McClosky lime at 3,034-50 ft., total depth, the well flowed 2,210 bbl. of oil during the first 24 hours. Four days later production had declined to 1,685 bbl.

Wabash County's prospective pool opener, the Sam Malis et al 1 W. L. Litherland, NW NW SE 20-1n-13w, continued to clean out and test the Levias lime at 2,720-32 ft. during the past week. Total depth of the well is 2,808 ft. and pipe has been perforated with 48 shots. This well has been swabbing at the rate of 650 to 900 bbl. of oil daily while cleaning out. It is approximately 2 miles from other producing wells and will open a new pool. Drilling is already under way at three offset wells.

In Richland County the Perry Fulk 1 C. W. Hawkins, SW SW NW 5-2n-9e, is cleaning out and testing the McClosky lime at 3,130-42 ft., total depth, after a small acid treatment made to clean the well. Oil is standing about 1,000 ft. in the hole, and indications point to a good commercial well. It is about 1 mile from other oil wells.

Illinois completions showed a decided downward trend during the past week as operators finaled only 18 oil wells and 20 dry holes. Eleven of the completed wells were wildcats, one of which was successful and opened a new pool midway between the Friendsville and Lancaster fields in Wabash County. New operations announced during the week totaled 32, and included 11 wildcats, 4 in Wayne County, 2 in Clinton, and 1 each in Wabash, Crawford, Edgar, Jefferson and Fayette counties.

ILLINOIS SUCCESSFUL WILDCAT

Wabash County: George Engle 1 Wilkinson, SE SE SE 14-1n-13w, pumped 40 bbl. oil and 5 bbl. water, 30-qt. shot 2,325-44 ft., Benoist sand 2,321-41 ft., TD 2,352 ft.

ILLINOIS WILDCAT FAILURES

Effingham County: Inland Oil Co. 1 C. Pendlay, NW NW SE 33-8n-5e, dry at 2,397 ft., Tar Springs sand 1,768 ft., Glen Dean 1,869 ft., Cypress sand 2,023 ft., Benoist sand 2,226 ft., Aux Vases sand 2,256 ft., Ste. Genevieve 2,305 ft.

Fayette County: W. M. Bell 1 Voeste, SW SE NW 12-5n-4e, dry at 2,530 ft., Tar Springs 1,984 ft., Benoist 2,350 ft., Renault 2,401 ft., Aux Vases 2,428 ft., Ste. Genevieve 2,470 ft.

Gallatin County: Oil Management 1 Davis, SW SW NE 20-7s-10e, dry at 3,055 ft., Tar Springs 2,295 ft., Glen Dean 2,397 ft., Cypress sand 2,618 ft., Paint Creek 2,696 ft., Renault 2,813 ft., Ste. Genevieve 2,920 ft., Levias 2,933 ft., Rosiclare 2,953 ft., McClosky 2,992 ft.

McLean County: Minnesota Prod. Co. 1 J. McGowan, NE SW NW 33-24n-5e, dry at 3,510 ft., Trenton 1,695 ft., St. Peter 2,110 ft., Shakapee 2,372 ft., New Richmond 2,720 ft., Leota 2,780 ft., Trempleau 3,260 ft.

Mercer County: Plymouth Well Co. 1 Scott, SW SE SW 18-13n-1w, dry at 486 ft., Base Pennsylvanian 159 ft., Kinderhook 159 ft., Devonian 325 ft.

Shelby County: Kenneth Carlyle et al 1 F. Frazier, SE SW NE 34-12n-6e, dry at 2,080 ft., Glen Dean 1,913 ft., Cypress sand 2,040 ft.

Washington County: Howard E. Watson 1 H. Helm, NE SE NE 26-2s-14w, dry at 1,486 ft., Glen Dean 875 ft., Cypress sand 1,074 ft., Benoist 1,109 ft., Renault 1,285 ft., Aux Vases sand 1,303 ft., Ste. Genevieve 1,406 ft., McClosky 1,445 ft.

T. Blake Dirickson 1 Brinkman, SW SE SE 20-1n-2w, dry at 1,541 ft., Glen Dean 1,945 ft., Cypress sand 1,148 ft., Benoist

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Wayne County: Superior 1 Fee, NW NE NW 14-3s-6e, dry at 3,470 ft., Glen Dean 2,713 ft., Cypress sand 2,958 ft., Renault 3,177 ft., Aux Vases sand 3,248 ft., Ste. Genevieve 3,289 ft., McClosky 3,333 ft.

White County: Joe Hobb 1 Williams, SW NW SE 28-3s-10e, dry at 3,265 ft., Benoist sand 3,075 ft., Aux Vases sand 3,140 ft., Ste. Genevieve 3,182 ft.

MISSISSIPPI

Mississippi Field Activity Continues at High Rate

JACKSON.—Field activity for Mississippi this week includes 56 working wells and three new locations: Sun Oil Co. 3 F. M. Snowden, SE SE NE 7-1n-16w, Lamar County; Texas Co. 2 Mrs. G. W. Bilbo, SE SE SE 8-1n-16w, Lamar County; Sohio-Roeser & Pendleton 1 Baker-Beach, irregular location 34-6n-2w, Adams County.

In Bruinsburg field, Claiborne County, Sun Oil Co. 3 W. R. Hammett, 15-11n-1e, had shows of gas at intervals in drilling mud, and is drilling ahead below 3,602 ft. Gulf Refining Co. 7 Ella G. Lees, 32-7n-1e, Cranfield field, Franklin County, is preparing to squeeze after flowing 741 bbl. of oil per day on a 7-hour test, and the same company's 1 J. B. Ruffin, 27-10n-13w, of Jasper County, Soso field, after coring several definite gas shows has set a 5½-in. casing at 6,698 ft. in Tuscalosa preparatory to completion as a gasser.

Humble Oil & Refining Co.'s wildcat, 1 E. L. West et al, NE SE 18-9n-7w, Wayne County, has been abandoned after perforating at 4,944-50 ft. and attempting three drill-stem tests which recovered only mud. This well had been cored intermittently with no shows, and drilled to a total depth of 8,500 ft. in Comanche with 5½-in. casing set at 4,999 ft. The state has 17 other active wildcats and 1 new wildcat location; Magnolia Petroleum Co. 1 G. Heindl, NE NE SE 21-9n-3e, Marion County.

MISSISSIPPI WILDCAT FAILURE

Lincoln County: Roeser & Pendleton 1 Columbus Lumber Co., NE NW 20-6n-6e, dry, TD 10,713 ft., Winfield 3,858 ft., Wilcox 4,046 ft., Midway 7,512 ft., Tuscaloosa 9,672 ft., Marine Tuscaloosa 10,230 ft., Massive sand 10,620 ft.

CANADIAN FIELDS

Lloydminster Now Ranks Second Largest Field

CHATHAM.—With an output for June officially reported at over 30,000 bbl., the Lloydminster field in western Saskatchewan and eastern Alberta now ranks next to Turner Valley as the second largest oil producing area in Canada. Operators estimate present potential at 40,000 bbl. monthly, but some wells are wholly or partially shut in pending improved refining and marketing facilities. Steel storage is reported filled, with two large earth sumps of 10,000 to 15,000 bbl. each full and a third receiving oil. A new refining plant of 5,000 bbl. daily capacity is planned for this fall, to produce tractor fuel and asphalt, and later lubricating oil from the heavy crude. The processed oil has been sold to the Canadian National Railways at $1.10 a barrel for fuel oil for its Rocky Mountain run; but the new plant is reported contracting for crude at $1.20.

Production comes from a depth of around 2,000 ft. and wells cost approximately $17,000 each to drill, as against an average of $250,000 in Turner Valley and the foothill areas.

On the Saskatchewan side of the field, Lloytiminster Gas 6, LSD 13, 24-29-28w3, finished with initial production around 20 bbl. per hour on a 24-hour test. On the Alberta side, Patricia 1, LSD 16, 1-49-1w4, finished at 1,884 ft., started with pumping production of 50 bbl. In the Ribstone-Blackfoot extension of the field, 8 miles west and 2 miles north of Lloydminster, Lloydminster Gas Producers 3, LSD 13, 11-50-2w4, finished at 1,998 ft., is testing, with indications of the largest producer in the field.

Turner Valley.—In North Turner Valley, Home Oil 22, LSD 6, 32-20-3w5, testing Madison limestone at 8,434-8,956 ft., gave 415 bbl. in 6 hours after light acid treatment in the upper porous, with production settling to 144 bbl. a day.

Baxter Lake.—Possibilities of an important new field of heavy crude in east-central Alberta are indicated by continued tests at Baxter Lake Oils 1, LSD 12, 20-46-5w4. Pump has been installed after a 24-hour bailing run gave 100 bbl. with 5 to 6 bbl. of free water. A second test is being located.

Stolberg.—In the central Alberta foothills, tests in the Madison limestone at Imperial-Shell-Stolberg, LSD 3, 22-41-14w5, are nearing completion. Indications are that the well, which established an Alberta and probably Canadian depth record of 13,747 ft. is noncommercial, and will be abandoned.

KANSAS

Meade County Wildcat to Test State Line Area

LOCATION has been announced for the White Eagle Oil Co. 1 Adams Ranch in SW NW 11-35s-29w. This wildcat will be located southwest of the town of Uneda in southern Meade County, about 1 mile north of the Oklahoma-Kansas state line. Tentative plans call for setting pipe on the Mississippi, expected at around 3,000 ft., although it may be carried to Arbuckle lime zone. A year ago, Stanolind drilled a producer in 8-35s-30w, and a dry hole in 7-35s-29w.

Shell Oil Co.'s Rooks County wildcat, the 1 Veverka, NW SE SE 21-8s-19w, swabbed oil at the rate of 15 bbl. per hour on tests made during the past week. The swab test was made after treating the well with 1,000 gal. of acid at a total depth of 3,450 ft. The Arbuckle was topped at 3,443 ft. and pipe was set at 3,444 ft. The 1 Veverka is about 1½ miles north of the new Webster pool, which was opened earlier this year.

The Burnett Southwest pool of Ellis County, opened less than 3 months ago, with production from the Arbuckle lime, has been given a new producing horizon. H. H. Blair 1 Opdyke, SE SE SE 15-11s-18w, opened the new formation, the Lansing-Kansas City lime, and has been given a minimum rating of 20 bbl. of oil daily.

J. C. Farley is installing pumping equipment at his new discovery well, the 1 Wiesner, SE SE SE 26-13s-20w, in Ellis County. Latest reported gage on the well was 3½ bbl. of oil an hour following an acid treatment of 500 gal. at a total depth of 3,815 ft. in the Arbuckle. The 1 Wiesner is approximately 1 mile northwest of the Pleasant pool in the western part of the county.

KANSAS WILDCAT FAILURES

Pawnee County: J. M. Huber Corp. 1 Smith, NW NW NW 22-20s-16w, dry, TD 3,832 ft., anhydrite 1,110 ft., brown lime 3,505 ft., Lansing-Kansas City 3,512 ft., Basal Kansas City 3,727 ft., Marmaton lime 3,750 ft., Simpson 3,812 ft., Arbuckle 3,825 ft.

Rice County: Phil-Han Oil Co. 1 Shonyo, NW NW SE 10-18s-10w, dry, TD 3,299 ft., anhydrite 505 ft., Topeka 2,600 ft., Lansing-Kansas City 2,946 ft., conglomerate 3,264 ft., Arbuckle 3,280 ft.

Wichita County: E. M. Swearer et al 1 Deal, NE NE SW 25-18s-37w, dry, TD 4,998 ft., Blaine 1,600 ft., Hollenberg 2,790 ft., Herrington 2,852 ft., Topeka 3,670 ft., Lansing-Kansas City 4,076 ft., Mississippi lime 4,921 ft.

Woodson County: R. L. Brineager et al 1 Bauersfeldt, SW NE SW 35-25s-14e, dry, TD 1,500 ft., Squirrel sand 1,230 ft., Bartlesville zone 1,396 ft.

LA.-ARK.

New Pool in Prospect For Ouachita County

SHREVEPORT.—A new pool may be opened in Ouachita County, Arkansas, by Joe Mucher's prospective discovery, the 1 Smith, NE SE SW 30-15s-17w, which continues testing after perforating at 2,777-83 ft. and testing 31°-gravity oil with no salt water. J. Lee Youngblood 1 Berg was locating in SE SW SW 29-15s-17w, southeast of the hopeful wildcat.

In North Louisiana, Kerr-McGee Oil Co. 1 Harry Johnson, NE SW 33-19n-14w, 6 miles northwest of Shreveport in Caddo Parish, is drilling below 5,720 ft. and will be taken into the Travis Peak or deeper. Jarvis, Marcell & Shoonmaker 1 James, 4-11n-14w, DeSoto Parish, was coring ahead near Pettit lime below 5,745 ft. In Richland Parish, F. L. Bryant Co. 1 Thompson, SW NE 4-16n-7e, flowed gas and wash water after pipe was set at 2,683 ft. and perforated at 2,526-42 ft., and in Rapides Parish, Union Producing Co. 1 Tyler, 14-4n-3e, is locating as an offset to the field opener, the same company's 1 Belgard, which has proved a successful producer of high gravity oil.

NORTH LOUISIANA WILDCAT FAILURE

Richland Parish: R. L. Fisher et al 1 D. Robinson, C SE NE SE 13-17n-7e, dry, TD 3,301 ft.

OKLAHOMA

Testing Continued at Maysville Extension

THE Carter Oil Co. has resumed testing at the 1 Eskridge, NE NW SW 19-4n-2w, in the Maysville area of Garvin County, after testing the squeeze job in the original Bromide sand perforations. On the latest drill-stem test, the well flowed into pits for 3 hours, and then was turned into tanks and flowed 45 bbl. of oil and 50 bbl. of water in 6 hours through ½-in. bottom and ¾-in. top chokes. Following this test a retainer was set and the perforations resqueezed. This well shows promise of both extending the Maysville pool to the north and opening a new deeper pay horizon.

Ryan Consolidated Petroleum Co. has completed a good Dutcher sand well in the old Edna-Nuyaka producing area of western Okmulgee County. The 2 Kimble, 19-14n-11e, was rated at 500 bbl. of oil a day flowing through tubing from a total depth of 2,489 ft. Shows of oil were also encountered in the Red Fork sand. The well is offset by a small producer and a dry hole.

Developments in the Cotton County area, one of the most active recently discovered spots in Oklahoma, are continuing at a

rapid pace with nearly a score of wells ready to be drilled in and several others at intermediate stages of drilling. In addition, five new wildcat tests for the area were announced during the past week.

OKLAHOMA WILDCAT FAILURES

Carter County: Louall Drilling Co. 1 Champion, NE NE NW 25-4s-2e, dry, TD 3,502 ft., sand 2,235-85 ft. and 2,900 ft.

Cotton County: J. B. Russell 1 Compton, SW SW SW 2-4s-10w, dry, TD 2,011 ft., no tops reported.

OHIO, KENTUCKY

Lorain County Test Is In St. Petersburg Sand

COLUMBUS.—The Ohio Fuel's Sub-Trenton test in Pittsfield Township, Lorain County, 1 A. P. Lincoln, Lot 136, found the bottom of the Trenton at 4,252 ft., green shale at 4,252-55 ft., and St. Petersburg at 4,255 ft. Drilling is continuing at 4,276 ft., still in hard, sharp sand with no shows. In the Huntington Center pool, Ohio Fuel 1 Mike Moskal, Lot 2, Huntington Township, had 14-ft. sand, 2,444-60 ft. with a natural gage of 5,100,000 cu. ft. In La Grange Township, Hanley & Bird 1 Susanna Zeiner, Lot 32, reached the Clinton at 2,428 ft. and had 800,000 cu. ft. at 2,430 ft.

East of Somerset, Twenty Grand 3 Walter Garey, Section 10, Reading Township, Perry County, flowed 80 bbl. in 24 hours after a 90-qt. shot. Clinton sand was found at 3,063-97 ft.

The Hemlock Grove Berea sand pool in Meigs County had three completions this week, all by Preston Oil Co. No. 3 David S. Clark, Section 2, made 46 bbl. in 21 hours; No. 2 H. R. Cook, Section 2, made 12 bbl., and No. 3 Valentine 23 bbl.

The Industrial Gas deep test on Sidney Whitmire, Section 26, Salt Creek Township, Muskingum County, reached the Trenton at 5,815 ft.

Ashland field reported five locations, Lancaster four, Mt. Vernon 3, and the other fields two each. Cambridge field led in completions with 10, followed by Ashland with six.

EASTERN KENTUCKY

ASHLAND.—Martin County broke into the limelight during the week with a Kentucky-West Virginia Gas Co. completion at 1,017 ft. on the J. S. Mollett property with an open flow of 703,000 cu. ft. in the Maxon. Same company completed No. 816 on the M. M. Collins property in Magoffin County at 1,277 ft. for 622,000 cu. ft. in the Maxon, and No. 821 on the Robert Williams property in Pike County at 3,259 ft. for 52,000 cu. ft. in Big Lime and 45,000 cu. ft. in the shale.

Locations were noted on the E. L. Pinson property, Pike County; Woodloe Howard, Magoffin; Gholson Howard, Magoffin; H. C. Short, Knott; A. J. Kelley, Knott, and Harrison Hall, Knott.

WESTERN KENTUCKY

OWENSBORO.—Locations were announced during the past week for two new exploratory tests in the western Kentucky area. Fox & Fox have rotary derrick up and are ready to begin drilling operations at the 1 P. R. Grant, 15-P-28, Davies County wildcat 6 miles west of Owensboro. H. H. Weinert is clearing location at the 1 J. R. Breeden, 23-L-26, 6 miles east of Hanson in Hopkins County.

Two oil wells and six dry holes, one a wildcat, were completed in western Kentucky during the past week. New operations for the week included three new tests in Henderson County, and one each for McLean, Union and Webster counties, in addition to the two exploratory tests previously mentioned.

WESTERN KENTUCKY WILDCAT FAILURE

Daviess County: Vickers-Snyder 1 Rafferty, 17-P-28, elev. 402 ft., dry at 1,854 ft., Kincaid 953 ft., Viola 1,363 ft.

INDIANA

EVANSVILLE.—Continental 1-D Cooper Estate, SW SW 13-3s-14w, deep wildcat which failed to find production in lower horizons in the Griffin field of Gibson County, has been plugged back to 3,265 ft. from a total depth of 6,408 ft. Operators are now testing oil shows encountered in the St. Louis lime at 3,142-48 ft. Latest reported gage indicates that it is pumping at the rate of 15 bbl. of oil and 160 bbl. of water daily.

Nine completions were reported by Indiana operators during the past week, only four of these being finished as oil wells. One of the dry holes was a wildcat. New operations announced during the week included five in Gibson County and four each in Posey and Pike counties. No new exploratory wells were reported.

INDIANA WILDCAT FAILURE

Pike County: Addison W. Warner 2 Carl Schmidt, NE NE SE 18-1n-8w, dry through McClosky, TD 1,500 ft.

CALENDAR

September

National Petroleum Association, forty fourth annual meeting, Hotel Traymore Atlantic City, N. J., September 18-20.

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

Oklahoma Chemical Engineering Society, Burlingame Hotel, Bartlesville, Okla., September 18.

Liquefied Petroleum Gas Association, eight-state convention, Oklahoma City, September 18-21.

Southern California Meter Association, Rio Hondo Country Club, Downey, Calif., September 19.

Oklahoma Utilities Association, gas division, annual fall meeting, Biltmore Hotel, Oklahoma City, September 20.

Third 1946 regional technical meeting, Broadview Hotel, Wichita, Kans., September 26.

National Petroleum Council, Washington, September 26.

National Lubricating Grease Institute, fourteenth annual meeting, Edgewater Beach Hotel, Chicago, September 29-October 2.

October

American Association of Oilwell Drilling Contractors, sixth annual meeting, Plaza Hotel, San Antonio, Tex., October 1-2.

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Galvez Hotel, Galveston, Tex., October 3-5.

American Society of Mechanical Engineers, 3-day national conference on petroleum mechanical engineering, Mayo Hotel, October 7-9.

Thirty-fourth National Safety Congress and Exposition, Stevens Hotel, Chicago, October 7-11.

American Gas Association, annual meeting, Atlantic City, October 7-12.

Los Angeles Nomads, Mayfair Hotel, October 9.

California Natural Gasoline Association, twenty-first annual meeting, Ambassador Hotel, Los Angeles, October 11.

Houston Nomads, Old College Inn, Houston, October 14.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 16-18

American Institute of Mining and Metallurgical Engineers, Petroleum Division, annual meeting, Ambassador Hotel, Los Angeles, October 24-25.

American Association of Petroleum Geologists, midyear meeting, Buena Vista Hotel, Biloxi, Miss., October 24-25.

Independent Petroleum Association of America, annual meeting, Fort Worth, October 28-30.

Midwest Gas Association and Iowa State College Gas School and Conference, Ames, Iowa, October 28-30.

November

Los Angeles Nomads, Fall Festival, Mayfair Hotel, Los Angeles, November 2.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

Houston Nomads, Old College Inn, Houston, November 11.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

American Society for Metals, annual meeting, and National Metal Exposition, Atlantic City, N. J., November 18-22.

American Welding Society, annual meeting, Atlantic City, N. J., November 18-22.

American Institute of Mining and Metallurgical Engineers, iron and steel division, and institute of metals division, annual fall meeting, Atlantic City, N. J., November 18-22.

Rocky Mountain Oil and Gas Association, annual meeting, Shirley-Savoy Hotel, Denver, November 21-23.

December

American Society of Mechanical Engineers, New York, December 2-6.

New Mexico Oil and Gas Association, annual membership meeting, Artesia, N. M., December 4.

Interstate Oil Compact Commission, winter quarterly meeting, Dallas, December 9-11.

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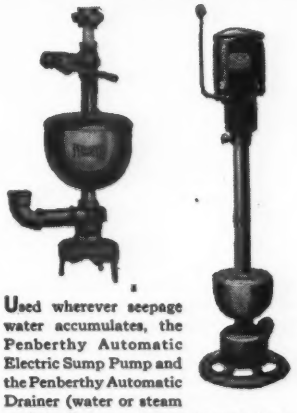

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Among the

Drilling Contractors

Gibson Drilling Co., Los Angeles, has contracted to drill Dolley and Morton's 6,000-ft. test in the Huntington Beach area, west of Signal Petroleum Co. 1 Callen, a recently completed producer.

Gene Reid Drilling Co., Bakersfield, has started making hole on Amerada Petroleum Corp. 38-10 Barnett, a test in Section 10-29s-29e, in the Ant Hill district, Kern County, California.

Regent Drilling Co., Calgary, Canada, has contract for Princess Brooks C.P.I. 1, LSD 13, 17-19-13w4, the first of two wells to be drilled in the Steveville-Princess field of eastern Alberta by a syndicate composed of Standard Oil Co. of California, Princess Petroleum, Pacific Petroleums, Globe Oil Co., Calmont Oils and Regent Drilling Co. Tests will be carried to the Madison limestone or deeper.

Segall Drilling Co., Kilgore, Tex., has contract to drill A. P. Merritt 1 Henry Norris, F. A. Tabor Survey, a Smackover lime wildcat in the Aquilla sector of southwestern Hill County, Texas.

Fowler Drilling Co., Long Beach, has contract to drill M. R. & M. Syndicate (John Marion, H. H. McVickar and C. M. Bond) 1 Capron, a 5,000-ft. test near the intersection of Nineteenth Street and Placentia Avenue, Costa Mesa district, Orange County, California.

Crow Drilling Co. has contract to drill Magnolia Petroleum Co.'s 1 G. Heindl, Section 21-9n-3e, Madison County, Mississippi. Location is on a Magnolia core-drill area.

K. L. Kellogg & Sons, Long Beach, have contract to drill A. W. Lyddon 2 Lamb Community, a recently staked location in the West Newport area of California. In the same vicinity, **Ralph M. Parsons Co.**, Los Angeles, will drill Tide Water Associated Oil Co. 2 Norris.

Abbott-Jenks Drilling Co., **Loffland Bros., Inc.**, and **Camay Drilling Co.** will share in drilling 18 wells for Union Oil Co. in the Santa Maria field and other areas of Santa Barbara County, California, coastal district.

Morris & Meredith, Inc., Houston, have taken contract to drill Felix Jackson 1 in Chambers County for Standard Oil Co. of Texas. Contract depth is 9,200 ft.

Pacific Drilling Co., Long Beach, has received contract to drill Wood Callahan Oil Co. 1 Coyote, 4-3s-9w, in the Olinda area, Orange County, California.

Olsen-Blount Drilling Corp., Oklahoma City, has set 5½-in. oil string of casing at 3,450 ft. and was moving in unit to shoot and clean out at the Olsen-Blount and Culbertson-Irwin, Inc., 4-1 Russell, in C NE SE 18-24s-37e, Langlie Mattix field, Lea County, New Mexico. Contractor was drilling at 3,393 ft. on the Uscan

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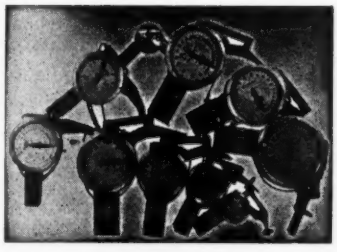

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Drilling Co. 1 Bates, in C SW SE 18-24s-37e, in the same field. In Oklahoma County, Oklahoma, contractor set oil string of casing on the Stanolind Oil & Gas Co. A-1 Repogle, in NW NW 27-13n-4w, the West Edmond field. In Major County, Oklahoma, contractor was drilling at 2,803 ft. on the R. Olsen Oil Co. 1 Ott, in C W½ SW SE 4-21n-9w. This is a wildcat test to the Wilcox. Nine and five-eighths-inch casing was set at 2,334 ft.

O. L. Riley, Ventura, has contracted to drill Exeter Oil Co., Ltd., 2 Livingston in the Oxnard pool, Ventura County, California.

Pay Hike Granted Rig Builders

FORT WORTH, Tex.—Rig builders in East Texas and five other southern states have signed a new contract with 33 contractors, providing for increases of $2 a day in wages and $3 a day in automobile allowance, according to A. R. Kinstley, vice president of the Oil Workers International Union.

The new wage scale is $22 a day for rig builders, $24 a day for crew pushers and $14 for apprentices. Automobile allowance was increased from $12 to $15 a day.

The new contract affects O.W.I.U. workers in Louisiana, Arkansas, Mississippi, Alabama, Florida, and East Texas. Similar increases will be sought in the Mid-Continent, and an increase in wages for all oil workers may be sought when the new policy committee of the O.W.I.U. meets October 21 in Kansas City, union officials said.

Corrosion Experiments to Be Made in Eastern Fields

OIL CITY, Pa.—Experiments will be conducted on 25 oil wells in the Oil City-Pleasantville district to test laboratory-developed ideas for controlling corrosion in oil-producing operations under air-gas secondary recovery, the Pennsylvania Grade Crude Oil Association announced this week. Tests will be made under supervision of the association.

C. E. Stout, Parkersburg, W. Va., production research engineer for the association, said six operators have consented to cooperate in the tests on nine separate leases in the district. The field trials will investigate the use of zinc chromate and calgon, either in combination or separately, as a means of protecting present well equipment. Suggestions include elimination of galvanic couples between the brass barrel and the adjacent steel parts by means of insulated section or use of zinc protectors. Galvanized rods and tubing were recommended for use in replacements.

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Sohio Official Is Credited With 15 Patents

ELLIOTT B. McCONNELL, newly elected vice president in charge of manufacturing, and a director of Standard Oil Co. (Ohio), started his career in the technical phase of the oil business upon receiving his degree in chemical engineering in 1923 from Cornell University.

Following graduation, McConnell took a 6-month refinery-training course with Standard Oil Co. (N.J.) and was assigned work in the cracking-coil technical service and development division. This was followed by appointment as process inspector of tube and tank units, which involved visiting 15 refineries twice annually, acting as a clearing house on new developments in the process, and recommending operating improvements. He is credited with 15 patents in the petroleum field.

He joined Sohio in 1928 at the time the company was starting new cracking coils. The following year he was made assistant to the vice president in charge of manufacturing, and in 1945 was named general manager of the manufacturing department.

In the early part of the war, McConnell served as special assistant to the director of the refining division of Petroleum Administration for War on problems concerned with aviation gasoline.

Patrick A. McKenna, petroleum technologist formerly with the Office of Price Administration, has been appointed to the oil and gas division of the Department of the Interior.

Leo Connell, petroleum engineer, and **Carroll D. Fentress,** former member of Petroleum Administration for War, have also been added to the division.

Gavin B. Taylor, vice president in charge of the refining department of McColl-Frontenac Oil Co. of Toronto and Montreal, Canada, has been elected a director of the company.

J. R. Schwabrow has been appointed supervisor of oil and gas operations in the northwestern region for the U. S. Geological Survey, Casper, Wyo., succeeding Ernest A. Hanson who resigned last year.

P. M. Dinkins, an associate of the American Cyanamid Co. since 1923, has been elected president and a director of Jefferson Chemical Co., Inc., which was organized in 1944 by American Cyanamid and The Texas Co. to produce chemicals from petroleum and petroleum gases.

Ralph G. McIntyre, vice president in charge of manufacturing and sales of Standard Oil Co. of Texas, has been elected president of the company at a recent meeting of the board of directors. He succeeds the late A. J. Cunningham.

Dr. Glenn S. Dille, vice president in charge of land and exploration for Deep Rock Oil Corp., will resign from the company on October 1 and reenter the field of consulting geology. Prior to his association with Deep Rock, he had been a consulting geologist in Oklahoma, Kansas, and Texas.

Clyde Stansell, pulling-machine operator for Lone Star Producing Co. in the West Texas district, has been promoted to production engineer at Eastland, Tex. **M. O. Chapman,** district manager at Colorado City, Tex., has been transferred to Eastland replacing **C. M. Neville** who resigned. **Roy Porter,** district manager at Snyder, Tex., succeeds Chapman at Colorado City.

Col. E. W. Henderson, now on terminal leave from the Army, has been appointed deputy supervisor of the northwest division of the U. S. Geological Survey at Casper, Wyo. He was district engineer at Salt Lake City prior to entering the service.

Clyde T. Foster, vice president in charge of finance and accounting for Standard Oil Co. (Ohio), has been elected a director of the company.

Don Schumaker has been transferred from the Tulsa scouting office of Skelly Oil Co. to Wichita, Kans., to scout that area.

Ralph G. McIntyre, El Paso, formerly vice president of Standard Oil Co. of Texas, has been elected a director of the company. Other directors named, all of Houston, are **J. P. Fox, C. W. Reith** and **H. L. Smith.**

Dr. P. J. Merkus, Jr., manager of the research and development department of Shell Oil Co., Inc., has

P. J. MERKUS

F. C. CUTTING

been appointed assistant to the vice president in charge of manufacturing. He succeeds **H. D. Dale,** who has been named manager of the company's Wood River, Ill., refinery. **F. C. Cutting,** assistant manager of the research and development department, succeeds Dr. Merkus. **Roy W. Faulk,** former assistant superintendent at the Norco refinery, has been appointed assistant superintendent of the company's Houston refinery. **John B. Dunlap,** manager of the cracking department at the Houston refinery, succeeds Faulk as assistant superintendent.

L. M. Batten, superintendent of production in the Panhandle and Guyman areas of Texas for Cities Service Oil Co., will resign on October 1 to join the firm of Harrington & Marsh, Amarillo, Tex. He has been with Cities Service for over 28 years.

P. C. Spencer, general counsel of Sinclair Oil Corp., has been appointed a member of the American Petroleum Industries committee of the American Petroleum Institute.

Kenneth Ackley, Tulsa, formerly chief scout, has been appointed assistant to the superintendent of the

JOHN CAMPBELL

KENNETH ACKLEY

eastern division. The Carter Oil Co., according to **O. C. Schorp,** president. Ackley has already assumed his new duties at Mattoon, Ill. A native of Alba, Mo., Ackley spent 7 years with the California and Oklahoma highway departments following graduation from University of Oklahoma in 1929. In 1937, he became surface geologist with Carter at Medicine Lodge, Kans., later serving as subsurface geologist both at Mattoon and Seminole, Okla. He was named chief scout for Carter, with headquarters in Tulsa, in 1944 after spending 2 years as evaluation engineer at Baton Rouge. In the spring of 1946, he completed a special assignment in connection with drilling of a well at Cape Hatteras, N. C. Named to succeed Ackley as chief scout was **John Campbell,** Tulsa, who was graduated from the University of Illinois in 1930. Campbell has been serving as chief scout since January.

James F. Drake, president of Gulf Oil Corp., and **Orville Harden,** vice president of Standard Oil Co. (N. J.), were scheduled to leave New York September 5 aboard the Queen Mary for Europe. Other oil officials due aboard the liner included **Harold F. Sheets,** chairman of the board of Socony-Vacuum Oil Co., Inc., and **R. P. Russell,** president of Standard Oil Development Co.

Howard A. Cowden, Kansas City, president of Consumers Co-operative Association, is on his way to Zurich to complete details for an international co-operative oil league having a nucleus of 15 nations.

Glenn W. Poorman has been named assistant to **M. J. Rathbone,** president, Standard Oil Co. of New Jersey. Poorman has been with the Jersey Standard since 1932 when he started as a chemist. Since 1944 he has been general manager of supply and transportation. **R. A. Appleman** succeeds Poorman in that position.

G. W. POORMAN

SHIFTS—

R. P. Sprague, superintendent, Loffland Brothers Co., Bakersfield, Calif., to Sherman Oakes, Calif.; **Roderic Crandall,** engineer, Crandall & Osmond, Glendale, Calif., to Roswell, N. M.; **W. E. Gilbert,** engineer, Shell Oil Co., Inc., Los Angeles to Arlington Heights, Ill.; **A. W. Taylor,** engineer, Amerada Petroleum Corp., Lovington, N. M., to Big Lake, Tex.; **D. A. Davidson, Jr.,** engineer, Pan American Production Co., Dickenson, Tex., to Raymondville, Tex.; **G. W. Ross,** engineer, Superior Oil Co., Conroe, Tex., to Magnolia, Tex.; **R. A. Daugherty,** superintendent, Superior Oil Co., Conroe, Tex., to Magnolia, Tex.; **William W. Dallas,** engineer, Stanolind Oil & Gas Co., Corpus Christi to Houston; **J. M. Miller,** engineer, Humble Oil & Refining Co., Corpus Christi to Houston; **Lloyd C. Schumann,** engineer, Atlantic Refining Co., Dallas to Odessa, Tex.; **Tom T. Jones,** engineer, Stanolind Oil & Gas Co., Odessa, Tex., to Greggton, Tex.; **Carl L. Cummings,** engineer, Phillips Petroleum Co., Phillips, Tex., to Booker, Tex.; **Charles B. Barry,** engineer, Phillips Petroleum Co., Phillips, Tex., to Guthrie, Okla.; **R. L. Denham,** geologist, Humble Oil & Refining Co., New Orleans to Houston; **Thomas Debevoise,** superintendent, Hope Natural Gas Co., Brooklandville, Md., to Wilsonburg, W. Va.; **R. N. Bills,** geologist, Amerada Petroleum Corp., Vicksburg, Miss., to Bastrop, Tex.; **J. L. New, Jr.,** superintendent, Union Producing Co., Tinsley, Miss., to Shreveport, La.; **George A. McHugh, Jr.,** geologist, Stanolind Oil & Gas Co., Salt Lake City, Utah, to Cut Bank, Mont.; **Joe J. McCullough,** geologist, Union Oil Co., Boise, Idaho, to Cut Bank, Mont.; **Howard L. Maddox,** engineer, Atlantic Refining Co., Scott City, Kans., to Pratt, Kans.; **Joe P. Asher,** superintendent, Plantation Pipe Line Co., Ardmore, Okla., to Wewoka, Okla.; **A. C. Gilbert,** geologist, Devonian Oil Co., Oklahoma City to Tulsa; **Max E. Riley,** engineer, Sunray Oil Corp., Oklahoma City to Alice, Tex.

Vernor R. Breithaupt, of The Pure Oil Co.'s Illinois producing division, Olney, Ill., has returned to work following an illness of several months.

Dr. C. R. Wagner, secretary of the Division of Petroleum Chemistry, American Chemical Society, will address the Oklahoma Chemical Engineering Society at Bartlesville, Okla., Wednesday, September 18.

Hugh R. Brankstone, geologist of Gulf Oil Corp., has been elected president of the Pittsburgh (Pa.) Geological Society for 1946-47. Other officers elected include **Dr. Shailer S. Philbrick,** vice president; **W. B. Robinson,** secretary, and **C. H. Feldmiller,** treasurer.

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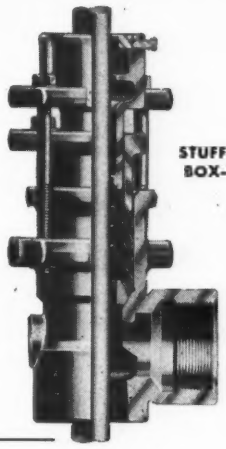

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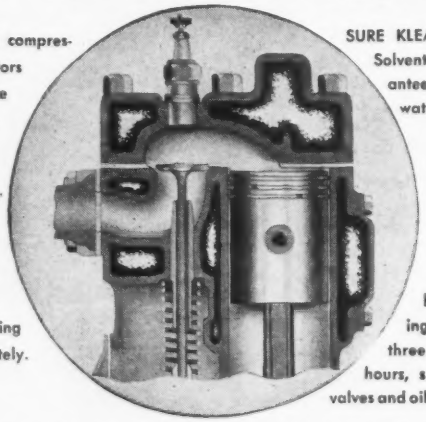

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Equipment Men in the News

Langdon Completes 30 Years With Goodyear

C. R. Langdon, Goodyear Tire & Rubber Co. manager of sales and office personnel, has completed 30 years' service with the company. Langdon began his Goodyear career as a production worker in 1916. Later he became a member of the famed training squadron, and was transferred to the California plant in 1919. He served in various sales positions on the West Coast until returning to Akron as sales school manager in 1928. Later, he was petroleum sales manager in California, district manager at Sacramento, and held a similar position in Cincinnati. He again returned to Akron in 1936, as manager of retail stores, and was appointed to his present post in 1939.

Schultz Joins Cook Research Laboratories

Cook Electric Co., Chicago, announces the addition of Edward E. Schultz to the engineering staff of its new division, Cook Research Laboratories, devoted to studies of major physical problems involving industrial processing and instrumentation. Schultz will assist in directing research on transient motion measuring instruments, flow controls, pressure switches, and aircraft controls involving electronic, hydraulic and mechanical systems.

J. D. Zaiser Becomes President, Ampco Metal, Inc.

J. DONALD ZAISER

J. Donald Zaiser has been elected president and general manager of Ampco Metal, Inc., Milwaukee, succeeding his father, C. J. Zaiser, who passed away July 29. The new Ampco president has been associated with the company since 1933 when, after graduating from Purdue University, he joined Ampco's production department. A year later he transferred to the field sales department and became department manager in 1936. He became general sales manager in January 1938; vice president and assistant general manager in October 1940; executive vice president in March 1944 and was appointed general manager in March 1945.

Graver Names Two To New Posts

Edward B. Heyden has been named to head the construction division of the Graver Tank & Manufacturing Co., Inc. Active in construction work since 1920, Heyden has been associated with The Lummus Co. for the past 14 years. He replaces Lloyd K. Wells, who is retiring to follow personal interests on the West Coast.

Graver has also recently announced the appointment of John E. Fogarty to the post of general manager of the firm's Sand Springs, Okla., plant. He formerly managed the Graver weldment division at the main plant in East Chicago, Ind. Storage tanks and other fabricated plate products are manufactured at the Sand Springs plant.

Spang-Chalfant Makes Four Promotions

The Spang-Chalfant division of The National Supply Co. made four promotions effective August 15, it is announced by George H. Clifford, vice president. Charles J. Ramsburg, Jr., and Eugene F. Conroy are now assistant district managers of the New York office; Edwin A. Booth is Pittsburgh district manager and Frank W. Morris is manager of the Tulsa district.

Rockwell Manufacturing Co. Adds Hydraulics Division

A new hydraulics division, to specialize in the development of hydraulic equipment, has been established by Rockwell Manufacturing Co., Pittsburgh. W. H. Marsh will be general manager of the division. Marsh joined Pittsburgh Equitable Meter division of Rockwell Manufacturing Co. in 1934 after previous experience with Pittsburgh Coal Co., Gulf Refining Co., John F. Casey, and Pennsylvania Pump Co.

Contractor Moves Offices

Oklahoma Contracting Co. announces removal of its offices from 1515 Magnolia Building to 1210 Mercantile Bank Building, Dallas.

Knode Joins Rector Well Equipment Co.

Rector Well Equipment Co., Inc. Fort Worth, announces the election of W. F. (Bill) Knode, consulting engineer in production problems, as vice president to serve in a research and advisory capacity. Knode was chief engineer of the oil and gas division of the Texas Railroad Commission from 1931 to 1934. He organized in 1938 the Alberta Conservation Board at Calgary, Alta., and served as chairman of that board for the first year. In 1941 he went into private consulting practice with offices in Corpus Christi, and shortly thereafter moved his headquarters to Fort Worth.

Oil Well Opens Uptown Office in Wichita Falls

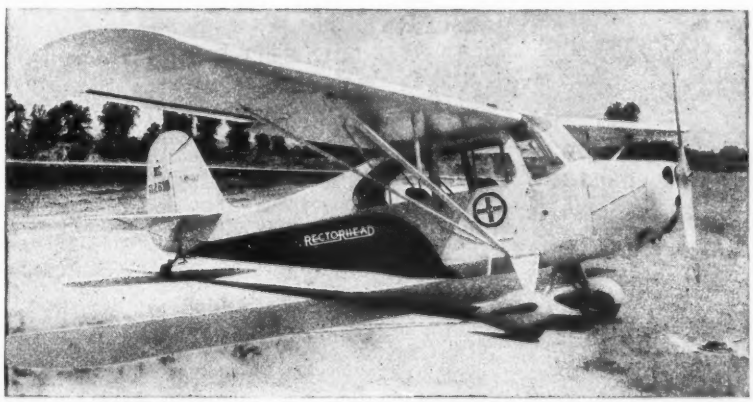
Opening of a new uptown district office in Wichita Falls is announced by Oil Well Supply Co., U. S. Steel Corp. subsidiary. The new office is located at 702 Staley Building and is occupied by William Miskimins, North Texas and Panhandle district manager for the company, and Harris W. Quaite, district inventory control supervisor, and their staffs. Previously, the district office was located at the Wichita Falls supply store of the company. Under the Wichita Falls district office are stores at Albany, Anson, Borger, Graham, Pampa, Abilene, and Wichita Falls.

Aro Elects J. E. Allen Executive Vice President

At a meeting of the board of directors of The Aro Equipment Corp., Bryan, Ohio, James E. Allen, vice president, was elected to the office of executive vice president, it is announced by J. C. Markey, president.

Duenner Named Representatives

Robert Duenner & Co. has been named sales representatives in Tulsa for Lukens Steel Co. and subsidiaries, By-Products Steel Corp. and Lukenweld, Inc., accord-



Here is a new wrinkle in emergency field service inaugurated recently by Rector Well Equipment Co. The new Aeronca Champion, now based at Shreveport in charge of Tom Harrell, is a fast means of getting on the job anywhere in his territory. This 1946 two-place plane carries either an extra passenger or the equivalent weight in equipment. It lands and takes off in an unusually small area and is regularly calling at wildcat locations. Bob Smith, Rector representative in the Corpus Christi area, has recently completed flight training, and other Rector personnel are taking instructions as pilots

ing to an announcement by J. Frederic Wiese, vice president in charge of sales. The Duenner organization will represent the three companies in Oklahoma, Kansas, Colorado and in Missouri, west of State Highway 65.

Dinkins Made President of Jefferson Chemical Co.

P. M. Dinkins has been made president and a director of Jefferson Chemical Co., Inc.

Jefferson Chemical was organized in November 1944, by American Cyanamid Co. and The Texas Co. to produce chemicals from petroleum and petroleum gases. Its first plant, now under construction at Port Neches, Tex., will produce intermediate chemicals used in the synthetic rubber, plastics, textile, and other industries.

Ronald Made Hyster Divisional Sales Manager

Ray Ronald has been named western division sales manager of Hyster Co., Portland, Ore., according to an announcement by Philip S. Hill, general sales manager of the firm.

Adelung Made District Manager

John W. Adelung has been appointed district manager of Mack's White Plains, N. Y., branch, it is announced by A. C. Fetzer, vice president of Mack-International Motor Truck Corp.

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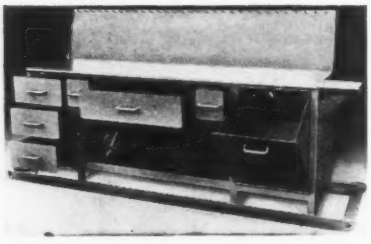

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Wallace Heads Sales for National Tube Co.

H. J. WALLACE

Appointment of Henry J. Wallace as general manager of sales is announced by United States Steel's National Tube Co. He succeeds W. F. McConnor who recently was elected National Tube vice president in charge of sales. Wallace began with the company in 1928 and took a National Tube student training course at the Lorain plant in 1929. He served in a sales capacity at Indianapolis and Pittsburgh until 1937, at which time he was made manager of sales of the Pittsburgh district office. In 1942, he was named assistant general manager of sales in charge of ordnance. Since 1945, he has been sales manager of the eastern area with offices in New York.

Emsco Promotes Roy Newcomb

Emsco Derrick & Equipment Co. announces the promotion of Leroy Newcomb from assistant chief engineer to the position of chief engineer of the Los Angeles machinery department. Newcomb served 4 years as chief engineer for the Emsco Asbestos Co. and joined Emsco Derrick & Equipment Co. in 1936. In his new capacity, he will have jurisdiction over all engineering phases of Emsco's complete line of oil-field drilling equipment manufactured in Los Angeles.

Donovan Appointed Martin-Decker Mid-Continent Representative

Martin-Decker Corp. announces appointment of "Mutt" Donovan as Mid-Continent sales and service representative with headquarters at Houston. Prior to assuming his new post, Donovan spent several months studying Martin-Decker equipment at the company's Long Beach factory and checking field practices.

A. O. Smith Export Division Moves to New Office

The International division of A. O. Smith Corp., which handles the company's export business, has moved from the company's main plant in Milwaukee to separate headquarters in that city's downtown area. Walter H. Porth, who has headed the company's foreign trade activity for 3 years, will continue in charge in the new headquarters.

Davidson Added to Pennsalt Sales Staff

John M. Davidson, recently released from the United States Naval Air Force, has joined the sales staff of the special chemicals division of Pennsylvania Salt Manufacturing Co.

Pittsburgh Equitable Meter Division Gets New Chief Engineer

E. R. Gilmore, who has been chief engineer of Emco products, has been appointed chief engineer of Pittsburgh Equitable Meter division of Rockwell Manufacturing Co. Gilmore will be in charge of engineering and development of the meters and regulators built by the division for the control of gas, gasoline and oil.

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